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**U.S. Army Research Institute
for the Behavioral and Social Sciences**

Research Report 1588

**Devices and Aids for Training M1 Tank
Gunnery in the Army National Guard:
A Detailed Analysis of Training Requirements**

David A. Campshure
Human Resources Research Organization

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April 1991

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report is the second in a series of four reports that describe the development of a device/aid-based strategy for training M1 tank gunnery in the Army National Guard (ARNG) at the company level. The first report reviews the military and research literature on five computer-based armor training devices and one training aid designed to train gunnery skills and knowledge for the M1 tank. This report assesses the capabilities of the devices and the aid reviewed in the first report to support gunnery training. The third report reviews current ARNG training practices, emphasizing the devices used and conditions that constrain gunnery training. The fourth and final report integrates the results from the first three reports and presents a detailed training strategy for using training devices and aids to support and augment on-tank gunnery training. This report assesses the devices by determining whether the devices (i.e., TopGun, the Videodisc Interactive Gunnery Simulator [VIGS], the Mobile Conduct-of-Fire Trainer [M-COFT], the Guard Unit Armory Device Full-Crew Interactive Simulation Trainer [GUARD FIST I], and (Continued)				
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19. ABSTRACT (Continued)

the Simulation Networking [SIMNET] battle simulation system) are capable of simulating the tank components and gunnery conditions associated with M1 tank gunnery, and the degree to which gunnery behaviors can be performed. The assessment of the training aid (the hand-held tutor) was conducted by determining whether the courseware for the aid is capable of imparting basic gunnery knowledge. Summaries of the results of these analyses are presented and the strengths and weaknesses of each device and aid for training armor gunnery are discussed.

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FOREWORD

The Army National Guard (ARNG) is emphasizing the use of training devices/aids to enhance home-station training of M1 tank gunnery. To this end, a four-phased research project is underway to identify (a) devices/aids available for use, (b) tasks to be trained on each device/aid, (c) environmental constraints affecting device/aid usage, and based on this information, to (d) develop a practicable ARNG device/aid-based M1 tank gunnery training strategy for use at home station. This report describes the results of the second phase of the project wherein the domain of M1 tank gunnery skills and knowledge is specified and the extent of domain coverage is assessed for each device/aid.

This research was conducted by the Training Technology Field Activity, Gowen Field (TTFA-GF), whose mission is to improve the effectiveness and efficiency of Reserve component (RC) training by using the latest in training technology. The research task supporting this mission, "Application of Technology to Meet RC Training Needs," is organized under the "Training for Combat Effectiveness" program area.

The National Guard Bureau (NGB) sponsored this research under a Memorandum of Understanding, signed 12 June 1985, establishing the TTFA-GF. Results have been presented to Chief, Organization and Training Division, Training Support and Management Branch, NGB; Chief, Training Division, Office of the Chief, Army Reserve (OCAR); Director, Training Development and Analysis Directorate (TDAD), TRADOC; and Deputy Director, Training and Doctrine, U.S. Army Armor School (USAARMS).



EDGAR M. JOHNSON
Technical Director

DEVICES AND AIDS FOR TRAINING M1 TANK GUNNERY IN THE ARMY NATIONAL GUARD: A DETAILED ANALYSIS OF TRAINING REQUIREMENTS

EXECUTIVE SUMMARY

Requirement:

Because of training constraints (e.g., lack of training time, limited access to range and maneuver areas) faced by armor National Guard units, gunnery training will have to rely heavily on training devices and training aids. The purpose of this research was to assess the capability of various devices and aids to support training of gunnery skills and knowledge for the M1 tank. Such an assessment is an essential prerequisite to the development of a detailed training strategy that will encompass these devices and aids.

Procedure:

This report was the second in a series of four reports whose purpose was to develop a device/aid-based strategy for training M1 tank gunnery in the Army National Guard (ARNG) at the company level. The first report reviewed the military and research literature regarding five computer-based armor training devices and one training aid designed to train gunnery skills and knowledge for the M1 tank. The training devices were (a) TopGun, (b) the Videodisc Interactive Gunnery Simulator (VIGS), (c) the Mobile Conduct-of-Fire Trainer (M-COFT), (d) the Guard Unit Armory Device Full-Crew Interactive Simulation Trainer (GUARD FIST I), and (e) the Simulation Networking (SIMNET) battle simulation system. The training aid was the Hand-Held Tutor (HHT). The research assessed the capability of the devices and aid reviewed in the first report to support gunnery training. The third report will review current ARNG training practices, emphasizing the devices used and conditions that constrain gunnery training. The results from the first three reports will be used in the development of a detailed training strategy for using training devices and aids to support and augment on-tank gunnery training.

Following discussions of previously developed armor training strategies (Hoffman & Morrison, 1988; U.S. Army Armor School [USAARMS], 1990) and work in the present series, the elements essential to assessment of the devices and the aid were described. Those elements were the devices and the aid being assessed and the domain of gunnery performance and prerequisite knowledge. Based on a review of previous research (Hoffman & Morrison, 1988; Morrison, Meade, & Campbell, 1990), the gunnery performance domain was specified as consisting of the gunnery-related M1 tank components, the conditions under which gunnery is conducted, and the behavioral actions performed during gunnery engagements. The assessment of

devices was conducted by determining whether or not devices were capable of simulating the tank components and gunnery conditions associated with M1 tank gunnery, and by determining the extent to which the gunnery behaviors could be performed on the devices. The assessment of the HHT was conducted by ascertaining whether or not the courseware for the training aid was capable of imparting the basic gunnery knowledges.

Findings:

The results showed that the two lost-cost devices, TopGun and VIGS, were able to support training of the basic precision gunnery skills. SIMNET, which allows training of complete tank crews, simulated the largest array of gunnery conditions and was the only device to simulate mission-oriented gunnery conditions. GUARD FIST I, which is attached to an actual M1 tank and provides full-crew training, sufficiently simulated most gunnery-related tank components and conditions and most gunnery behaviors to be practiced. Overall, M-COFT was found to be the most comprehensive device in terms of the components and conditions simulated and behaviors supported; it was followed closely by GUARD FIST I. The assessment of the HHT revealed that the training aid's courseware provided instruction on only a small, but important, subset of basic gunnery knowledges.

Utilization of Findings:

The results of this analysis of device/aid capabilities and limitations will be used, in conjunction with the results from the other research efforts in this series, to develop a detailed strategy for training armor gunnery in the ARNG at the company level. Specifically, the results of this research will be used during the formation of that strategy to select technologies that support training of gunnery skills and knowledges at each level in the instructional sequence.

DEVICES AND AIDS FOR TRAINING M1 TANK GUNNERY IN THE ARMY NATIONAL GUARD: A DETAILED ANALYSIS OF TRAINING REQUIREMENTS

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DEVICES AND AIDS FOR TRAINING M1 TANK GUNNERY IN THE ARMY NATIONAL GUARD: A DETAILED ANALYSIS OF TRAINING REQUIREMENTS

Introduction and Background

The amount of gunnery training armor units can conduct on their tanks is constrained by reductions in operating tempo (OPTEMPO) and training ammunition. Armor units in the Army National Guard (ARNG) are especially limited in the amount of training that can be conducted on-tank. For instance, the amount of time Reserve Component (RC) units have available for training is approximately 14% of that available to Active Component (AC) units (Eisley & Viner, 1988). Other problems that constrain on-tank gunnery training in the ARNG include shortages of the necessary equipment, limited access to training areas, and a lack of time for planning and preparing for training. As a result of these constraints, the ARNG is becoming increasingly reliant on advanced technologies (i.e., computer-based training devices and aids) to meet home-station training needs. In order to promote effective and efficient use of these technologies, guidance is needed to suggest how the devices and aids should be integrated to train and sustain gunnery skills. This guidance is referred to as a training strategy.

Previous Training Strategies

Two previously developed strategies have provided information on the use of training devices in armor gunnery training programs. The first strategy, designed to serve as a model for any device-based gunnery training program, was developed by Hoffman and Morrison (1988) for the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). The focus of this strategy was on the use of four computer-based devices (the Videodisc Interactive Simulator [VIGS], the arcade-like TopGun device, the Unit Conduct-of-Fire Trainer [U-COFT], and the Simulation Networking [SIMNET] battle simulation system) to train gunnery skills. Hoffman and Morrison developed their strategy by first specifying the conditions and actions that define the domain of tank gunnery. They then conducted an analysis to determine the extent to which the devices would support gunnery training through simulation of those conditions and actions. Finally, using heuristic guidelines derived from instructional theory and realistic constraints to gunnery training, they derived a hierarchy of instructional units. This hierarchy begins at the bottom with basic skills prerequisite to gunnery training and adds more advanced skills until proficiency of the domain is achieved. By assigning objectives and devices to the units of instruction at each level in the hierarchy, Hoffman and Morrison determined an appropriate sequence of instruction for the initial training of gunnery skills using the devices.

The second strategy, developed by the U.S. Army Armor School, presented a training strategy designed specifically for unit training. The Armor Training Strategy, ST 17-12-7 (U.S. Army Armor School [USAARMS], 1990) presented guidance "...for the use of fielded and programmed devices, simulators, and simulations that affect Armor training" (p. iii). This document suggested the frequency with which devices should be used and the length of training sessions on the devices. For the ARNG, ST 17-12-7 presented a 2-year armor training strategy that was divided into a gunnery year and a maneuver year. For each of the 2 years, the strategy presented

recommendations on the frequency of training on the devices and suggested the length of device training sessions for individuals/crews. This strategy was presented for the initial year (FY 1990) and was modified for the near-term (FY 1991-92), midterm (FY 1993-94), and far-term (1997-2005). Modifications were based on projected improvements to devices currently in use and the fielding of devices currently programmed.

The strategies presented by Hoffman and Morrison (1988) and in the Armor Training Strategy, ST 17-12-7 (USAARMS, 1990) were similar in that they provided general (macro-level) guidance regarding how the devices should be used to train gunnery skills. The expectation was that, with further research, more specific (micro-level) information could be added to these "macrostrategies" to increase the likelihood of their successful implementation by unit training developers and managers. The resulting "microstrategies" would include information such as specific exercises/lessons to be conducted on the devices, criteria for measuring progress or performance on the devices, alternate instructional paths for individuals/crews conducting initial and sustainment training, and provisional plans for modifying the strategy in cases where training time is limited and/or devices are inaccessible. This micro-level of specificity is especially important for the development of effective gunnery training programs for the ARNG, given the limited amount of time available for the planning and preparation of armor training.

Research in the Present Series

The present report is the second in a series of four reports whose purpose is to develop a device/aid-based microstrategy for training M1 gunnery skills in the ARNG. The first report in this series (Morrison, Drucker, & Campshure, 1990) identified five training devices capable of training gunnery skills for the M1 tank: (a) the TopGun device, (b) the VIGS, (c) the Mobile Conduct-of-Fire Trainer (M-COFT), (d) the Guard Unit Armory Device Full-Crew Interactive Simulation Trainer (GUARD FIST I), and (e) SIMNET. In addition, one training aid was identified as being capable of imparting knowledges associated with M1 gunnery training: the Hand-Held Tutor (HHT). The military and technical literature pertaining to the devices and the aid were reviewed to provide three types of information: (a) the training functions that the technologies supported, (b) any published training strategies that apply to the devices and the aid, and (c) the basic fidelity and instructional features. The primary focus of the report, however, was on the extant research literature relating to skill acquisition, skill retention, performance prediction, and transfer of training for each device/aid. The reviews of the military documents and research literature revealed that there is (a) overlap among the devices in that they train many of the same skills, (b) substantial evidence that gunnery skills/knowledges are acquired on the devices/aids, (c) little empirical data on the issue of skill retention, (d) inconclusive evidence as to whether the devices/aids can be used to predict on-tank performance, and (e) some evidence that skills acquired on the devices transfer to the actual tank.

The objective of the present research, the second report in the series, was to assess the extent to which the training technologies reviewed by Morrison, Drucker, and Campshure (1990) are capable of supporting training of the skills and knowledges associated with M1 tank gunnery. The third report

in the series will review current ARNG armor training practices, emphasizing the devices used and conditions that constrain gunnery training. Such information is necessary to provide alternate approaches for modifying the microstrategy in situations where training time is limited and/or devices are inaccessible.

Information from the first three reports will provide the foundation for the development of a detailed strategy for using training devices and aids to support and augment gunnery training on the tank, which will be documented in the fourth and final report in this series. This microstrategy will provide guidance to ARNG training developers and managers for using the devices and aids to train both the initial acquisition and sustainment of gunnery skills at the local armory (company) level. The strategy will also present suggestions for revising training to accommodate existing training constraints.

Purpose of the Present Research

The purpose of the present research was to examine the extent to which the training technologies reviewed during the first phase of this research are capable of supporting training of M1 tank gunnery skills. The goal of this research was not to quantitatively determine the "best" or "optimal" technology or technologies for training gunnery. Rather, the goal was to determine the relative strengths and weaknesses of the devices and aid for training the skills and knowledges that comprise the domain of armor gunnery. Thus, a qualitative approach was employed to analyze the appropriateness of each device and aid for training armor gunnery skills and knowledges in the ARNG.

This research represented an update and an expansion of Hoffman and Morrison's (1988) assessment of armor training devices. It was an update in that the devices examined in the present report were more recent versions of the devices analyzed by Hoffman and Morrison, or were technologies that have emerged since their analyses. It was an expansion in that it used an enlarged version of Morrison, Meade, and Campbell's (1990) description of the gunnery domain, which was an extension of the domain as defined by Hoffman and Morrison, to assess the devices and the aid.

The results of this analysis of device/aid capabilities and limitations are prerequisite to the final objective of the research in this series: development of a device/aid-based microstrategy capable of being implemented in the ARNG at the company level. Detailed information on the gunnery skills and knowledges that can be trained on each of the devices/aids will be used during the formation of the strategy to select technologies that support training at each level in the instructional sequence.

Method

Two elements essential to the analysis are described first: (a) the training devices and aid identified as relevant to ARNG gunnery, and (b) the domain of gunnery performance and prerequisite knowledges. Following the descriptions of those elements, the procedures that were used to assess the training capabilities of the devices and aids relative to the performance domain and the knowledges are explained in detail.

Training Devices and Aid

The training devices and the training aid that were assessed are all computer-based technologies designed to train M1 gunnery-related skills or knowledges. Brief descriptions of the devices and the HHT training aid are provided below. Detailed descriptions of those training technologies are presented by Morrison, Drucker, and Campshure (1990).

TopGun

TopGun was developed as a research device to examine the utility of an inexpensive arcade-type video game for training and sustaining gunner skills. It is a part-task trainer in that it is designed primarily to train the basic psychomotor skills that underlie gunner behaviors. TopGun has been suggested as a training medium for use by RC armor units in home-station armories and reserve centers (Hart, Hagman, & Bowne, 1990). Because the device remains a research technology, it has not been officially fielded.

VIGS

VIGS is a tabletop, part-task gunnery trainer. It is designed to train and sustain only the basic gunnery skills required by the gunner in the M1 and M1A1 tanks. By presenting target scenarios, VIGS provides the gunner with practice manipulating fire system controls, monitoring fire system control indicators, and reacting to fire commands. The device is currently available to the ARNG for use in home-station armories.

M-COFT

The M1 M-COFT is a transportable, high fidelity gunnery simulator designed to train and sustain critical skills required of tank commanders (TCs) and gunners during tank gunnery engagements. The device presents a full range of target engagement situations to a TC and gunner team placed in simulated crew stations. In descending order of importance, the four training purposes supported by M-COFT are (a) to sustain year-round gunnery skills of experienced TCs and gunners, (b) to cross-train loaders and drivers in gunner duties and gunners in TC duties, (c) to transition train armor personnel to the M1 or M1A1 tank, and (d) to provide nonarmor personnel (i.e., cooks, mechanics) with basic gunnery training so that they may serve as battlefield replacements (U.S. Army Armor Center, 1985). The current issue plan calls for the fielding of one M-COFT per RC battalion.

GUARD FIST I

GUARD FIST I, is a tank-appended device which presents computer-generated imagery through the sights of a static M1 tank (i.e., dead turret, power-off mode). The device also enables many of the tank's controls to be used to engage computer-generated targets much as they would be used in a live-fire engagement. An important aspect of GUARD FIST I is its capability to provide simultaneous training for all four crew members. GUARD FIST I is a developing technology and has not yet been fielded. The proposed issue plan is to distribute one GUARD FIST I per ARNG company.

SIMNET

SIMNET was developed as a research project for the large-scale networking of low-cost interactive combat simulators. The networking was designed to link large numbers of simulators within a single site and across geographically separated sites. The objective of the device is to use networking technology to provide a battlefield simulation that enables armor crews to participate in platoon-, company-, and battalion-level force-on-force exercises. Like GUARD FIST I, SIMNET allows full-crew interactive training. A single SIMNET simulator consists of a driver's compartment and a crew compartment with loader, gunner, and commander stations. Because SIMNET was developed as a demonstration of networking technology, there are no issue plans. However, there are plans for fielding a direct follow-on to SIMNET, the Close Combat Tactical Trainer (CCTT), which should have similar capabilities. The issue plan for CCTT has not been finalized.

HHT

The HHT is an inexpensive, portable, microprocessor-controlled training aid for presenting and controlling programmed learning exercises. It was designed to provide instruction on knowledges related to certain military tasks. With regard to M1 tank gunnery, two HHT courseware booklets have been developed to impart knowledges required by the TC (a) to execute appropriate fire commands for single and multiple targets and (b) to direct engagements under degraded modes of operations and to conceive strategies for dealing with multiple returns from the laser rangefinder. Like TopGun, the HHT is a research technology and, therefore, has not been distributed to either AC or RC units.

Domain of Gunnery Performance and Prerequisite Knowledges

Before evaluating the capability of devices and aids to support gunnery training, it was necessary to specify the domain of tank gunnery performance. The components of that domain provide the requirements for training tank gunnery in the ARNG. For device-based training, these requirements specify the required gunnery behaviors and the tank features necessary to execute those behaviors. For training aids, the requirements specify the knowledges that are required to perform tank gunnery. The foundation for the identification of the training requirements was provided by Hoffman and Morrison's (1988) analysis of the domain of gunnery performance and their hierarchical analysis of gunnery training objectives. Accordingly, their definition of the domain is discussed in the next section, and is followed by an explanation of how that domain was expanded by Morrison, Meade, and Campbell (1990) and adapted for use in the present research.

Domain as Defined by Hoffman and Morrison

In their report documenting the development of their general device-based training strategy, Hoffman and Morrison (1988) presented a description of the gunnery performance domain. Although their description of the domain was confined to the crew duties performed by individual crewmen, it included events, conditions, and actions that are required of a crew while operating in the context of a platoon mission. Thus, their definition of the gunnery domain not only included performance requirements of "pure" crew-level gunnery

exercises like Tank Table VIII, but was expanded to encompass gunnery in a tactical context. To emphasize this point they referred to the domain as the domain of M1 *tactical gunnery*.

Hoffman and Morrison's (1988) description of the tactical gunnery domain consisted of two components: (a) a list of tactical gunnery behaviors and (b) a list of tactical gunnery conditions. The list of behaviors was composed of the actions required to conduct tank gunnery (e.g., close ammo doors, depress lase buttons, issue fire command) which were arranged into the major activities associated with tank gunnery (e.g., fire main gun, fire coax, subsequent fire commands). These activities were roughly equivalent to tasks,¹ and the subordinate actions were equivalent to steps within a task. The list of conditions under which gunnery could be conducted (e.g., night, moving target, tank target) was partitioned into situational parameters (e.g., visibility conditions, target motion, target type). The lists of behaviors and conditions were not independent, but deliberately overlapped. That is, where conditions required different gunnery behaviors, the behaviors were separated into different tactical gunnery activities. For example, the behaviors required to engage a main gun target given unlimited day visibility were different from the behaviors required to engage the same target at night; consequently, the behaviors were segregated into different activities. Conditions that had an effect on the behaviors that were required, and therefore on the organization of the gunnery activities, were referred to by Hoffman and Morrison as primary conditions. Conditions such as terrain vegetation, that could hinder the performance of a task but did not alter the behaviors involved or the organization of the activities, were referred to as secondary conditions.

In addition to their analyses of behaviors and conditions, Hoffman and Morrison (1988) conducted a hierarchical analysis of the tactical gunnery domain to identify the prerequisite objectives for each of the actions within an activity. At the lowest level of the hierarchy, these prerequisite objectives represent the basic knowledges required to perform the actions that constitute the crew-level tactical gunnery domain. It is these basic knowledges that provide the training requirements for gunnery training aids.

Expanded Domain Used in the Present Research

The lists of tactical gunnery behaviors, conditions, and basic knowledges as defined by Hoffman and Morrison (1988) were reviewed to ensure complete coverage of the domain of tactical gunnery in the ARNG. This review revealed the need for an additional list consisting of the tank components used during the conduct of tactical gunnery. This list would provide a simple means for identifying gunnery skills that could not be trained on a device because the required tank component was not simulated. The review also uncovered the need to expand the list of gunnery behaviors to include additional basic crew-level activities as well as leadership and collective activities defined at the section and platoon level. Morrison, Meade, and

¹Although activities are roughly equivalent to "tasks," the term activities was chosen to avoid conflict with the Army's official list of armor tasks.

Campbell (1990) had previously noted that these activities were missing from the list compiled by Hoffman and Morrison. The individual elements of the expanded domain are described in more detail below in the order that they were used in the assessment process.

Tank components. An analysis of tactical gunnery behaviors was conducted to identify the tank components (e.g., switches, controls, sights) necessary to conduct tactical gunnery engagements. Six main tank components were identified. These components and their subcomponents are presented in Table 1. This list of components and subcomponents was used to rate how well the devices simulated the tank equipment required to execute tactical gunnery engagements.

Gunnery conditions. The list of situational parameters and their subordinate conditions, adapted from a list originally compiled by Hoffman and Morrison (1988), is shown in Table 2. This inventory was used to assess each device's capability to support the training of gunnery skills within a tactical context.

Crew-level behaviors. During an analysis of the domain of crew gunnery behaviors, Morrison, Meade, and Campbell (1990) identified four crew-level activities that were missing from Hoffman and Morrison's (1988) list of tactical gunnery behaviors. Those four activities (engage target using loader's M240 machine gun, immediate action misfire, employ smoke, and submit reports) were included in the present analysis. Table 3 presents the resulting inventory of crew-level tactical gunnery activities used in the present research. The activities and subordinate actions are shown by individual crew member in Appendix A. Many of the activities are subdivided into "options" indicating the alternate courses of actions possible given various equipment and threat conditions. One activity, Acquire Targets, is divided into "parts" that are sequential. In general, the activities themselves are not performed in a rigid sequence but branch and loop as indicated in Figure 1. Pre-operations (preops) checks and prefire checks, however, would be performed prior to all missions. The branches in Figure 1 result from decisions made by the TC from information gained during the preops and prefire checks (e.g., equipment malfunctions), and from environmental, mission and threat conditions.

Section/Platoon-level behaviors. As enumerated in Standards in Weapons Training, DA PAM 350-38, (Department of the Army [DA], 1988b) and Tank Combat Tables M1, FM 17-12-1, (DA, 1988c), on-tank gunnery and tactical training in the ARNG includes section- and platoon-level tasks as well as crew-level exercises. Consequently, the section/platoon-level activities identified by Morrison, Meade, and Campbell (1990) were also included in the present analyses. They contended that the domain of section/platoon-level gunnery tasks consisted of two components: (a) platoon leadership activities performed by platoon leaders and sergeants to initiate or control platoon movement and fires, and (b) section/platoon collective activities performed by tank crews operating within the context of a section or platoon. For the present analysis, four options were added to the list of section/platoon-level activities compiled by Morrison, Meade, and Campbell: (a) move tactically using the wingman concept, (b) execute herringbone formation (c) execute coil formation, and (d) react to indirect fire. Table 4 shows the list of platoon

Table 1

M1 Gunnery-Related Tank Components

Component	Subcomponents
1. Weapons	<ul style="list-style-type: none"> a. Main gun b. Commander's machine gun c. Coaxial machine gun d. Loader's machine gun e. Grenade launcher
2. Sights	<ul style="list-style-type: none"> a. Commander's Weapon Station (CWS) unity periscopes b. CWS sight c. Gunner's Primary Sight Extension (GPSE) d. Gunner's Primary Sight (GPS) e. Gunner's Auxiliary Sight (GAS) f. Thermal Imaging System (TIS) g. Loader's periscope h. Driver's periscopes i. Night vision viewer
Fire System Controls:	
3. Commander's Station	<ul style="list-style-type: none"> a. CWS control handle b. Commander's control handle c. Commander's control panel d. Cupola manual traverse/elevation controls
4. Gunner's Station	<ul style="list-style-type: none"> a. Control handles b. Ballistic computer control panel c. GAS control panel d. Intercom controls e. Manual traverse/elevation controls f. Reticle control panel g. Fire control panel h. TIS control panel i. Laser Rangefinder (LRF) control panel j. Muzzle Reference Sensor (MRS) lever
5. Loader's Station	<ul style="list-style-type: none"> a. Loader's control panel b. Intercom controls c. Turret traverse lock d. Main gun breech block e. Ammo doors and racks f. Knee switch
6. Driver's Station	<ul style="list-style-type: none"> a. Driver's master panel b. Driver's instrument panel c. Driver's alert panel d. Steer/throttle controls e. Brake pedals

Table 2

M1 Tactical Gunnery Conditions

Parameters	Conditions	Comments
1. Target Type	Main Gun a. Tank b. Personnel Carrier c. Helicopter d. Bunker Machine gun e. Antitank f. Truck g. Troops (including grenade launchers and antitank grenade missile teams) h. Fixed wing, high performance aircraft	Distinction between main gun and machine gun targets is primary. Within main and machine gun conditions, targets are secondary.
2. Target Movement	Stationary a. Front b. Flank c. Oblique Moving d. Flank e. Oblique f. Zig-zag g. Approaching h. Retreating	Stationary versus moving is primary in that it affects the need to track; otherwise the conditions are secondary.
3. Target Cover/ Concealment	a. Fully exposed b. Hull defilade c. Turret defilade d. Fully hidden	Secondary conditions
4. Target Array	a. Single targets in distinctly separate engagements b. Multiple targets in distinctly separate engagements c. Single and multiple targets appearing unpredictably within a single exercise	Primary conditions
5. Target Orientation	a. Threat weapons oriented on own tank b. Threat weapons oriented elsewhere	Secondary conditions (affects how targets are classified, but does not change activities)

(table continues)

Parameters	Conditions	Comments
6. Target Range	a. Up to 900 meters (Coax tracer burnout) b. 900-1800 meters (Cal .50 maximum effective range) c. 1800 meters and beyond	These range intervals (along with target type) are primary conditions for weapon selection. Additional intervals within each category are secondary conditions for range estimation and evaluation of LRF returns. Additional range intervals, based on the error tolerance of the ballistics system (e.g. +/-200 meters) should be considered part of the gunnery domain.
7. Target Sector	a. Forward b. Flanks c. Rear	Secondary conditions
8. IFFN (identify friend or foe nomenclature)	a. All threat b. All friendly c. Mix of threat and friendly	Primary conditions
9. Enemy Activity	a. No return fire b. Direct fire c. Indirect fire d. Obstacles e. Minefields f. Electronic countermeasures	Secondary conditions
10. NBC (nuclear, biological, chemical) conditions	a. Free of hazards b. Contaminated	Secondary conditions
11. Equipment Status	a. Fully operational b. Ineffective LRF c. Multiple LRF returns d. Loss of symbology e. Crosswind sensor failure f. Cant sensor failure g. Lead angle sensor failure h. GPS failure i. GPS/TIS failure (night) j. Stabilization failure k. Turret power failure	Secondary conditions
12. Number of Crewmen	a. Four b. Three	Primary conditions
13. Supply Shortages	a. None b. Ammo c. Fuel	Primary with respect to ammo selection,

(table continues)

Parameters	Conditions	Comments
14. Mission	a. Offense (moving) b. Defense (stationary)	Primary conditions
15. Fire Control	a. Single Tank Section Control b. Frontal c. Cross d. Depth Platoon Control e. Frontal f. Cross g. Depth	Secondary conditions (affects target selection)
16. Formation	a. Column b. Echelon left/right c. Staggered column d. Line e. Wedge f. Herringbone g. Vee h. Coil i. Combat column	Secondary conditions
17. Special Engagement Requirements	a. Surprise targets b. Assault fire c. Support by fire d. Fire and maneuver e. By-pass	Secondary conditions
18. Space	Offensive a. Support by fire position interval b. Fire and maneuver interval c. Assault interval Defensive a. Fire position interval	Secondary conditions
19. Visibility	Day a. Unlimited b. Haze, smoke, rain, snow, or fog Night c. No illumination d. Continuous illumination (fire, moon) e. Periodic illumination (flares)	Primary with respect to selection of TIS and LRF
20. Terrain Grade	a. Level b. Up slope c. Down slope d. Hilly	Secondary conditions
21. Terrain vegetation	a. None b. Brush c. Trees	Secondary conditions

Note. Adapted from "Requirements for a Device-Based Training and Testing Program for M1 Gunnery: Volume 1. Rationale and Summary of Results" by R. G. Hoffman and J. E. Morrison, 1988, U.S. Army Research Institute, Tech. Rep. 783, p. 11.

Table 3

Crew-level Tactical Gunnery Activities, Parts, and Options

ACTIVITY 1.	PREPARE STATIONS FOR OPERATION (PREOPS)
ACTIVITY 2.	PERFORM PREPARE-TO-FIRE (PRE-FIRE) CHECKS
	Option 2.1. Prepare for offense
	Option 2.2. Prepare for defense
ACTIVITY 3.	ACQUIRE TARGET(S)
	Part 3.1. Search for target(s)
	Option 3.1.1. Search open hatch--day
	Option 3.1.2. Search open hatch--night
	Option 3.1.3. Search at night
	Part 3.2. Detect/Locate/Identify target(s)
	Part 3.3. Evaluate situation
ACTIVITY 4.	ENGAGE SINGLE TARGET WITH THE MAIN GUN
	Option 4.1. Engage single target from offense using precision gunnery
	Option 4.2. Engage single target from defense using precision gunnery
	Option 4.3. Gunner cannot identify announced target
	Option 4.4. Engage targets using Thermal Imaging System (TIS)
ACTIVITY 5.	ADJUST FIRE
	Option 5.1. Use reengage technique
	Option 5.2. Use standard adjustment
	Option 5.3. Use Tank Commander's (TC) adjustment
ACTIVITY 6.	ENGAGE A SINGLE TARGET WITH THE COAX
ACTIVITY 7.	ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN
ACTIVITY 8.	ENGAGE TARGETS WITH THE CAL .50 / SIMULTANEOUS ENGAGEMENTS
	Option 8.1. Simultaneous targets
	Option 8.2. Cal .50 targets
ACTIVITY 9.	ENGAGE TARGET USING DEGRADED GUNNERY TECHNIQUES
	Option 9.1. Engage target using battlesight gunnery
	Option 9.2. Engage target given ineffective Laser Rangefinder (LRF)
	Option 9.3. Engage target given multiple returns from LRF
	Option 9.4. Engage target given no range display (loss of symbology)
	Option 9.5. Engage target given crosswind sensor failure
	Option 9.6. Engage target given cant sensor failure
	Option 9.7. Engage target given lead angle sensor failure
	Option 9.8. Engage target given Gunner's Primary Sight (GPS) failure
	Option 9.9. Engage target given GPS/TIS failure
	Option 9.10. Engage target using Gunner's Auxiliary Sight (GAS)
	Option 9.11. Engage target given stabilization system failure (emergency mode)
	Option 9.12. Engage target given turret power failure (manual mode)
ACTIVITY 10.	ENGAGE TARGET(S) FROM THE TC POSITION
ACTIVITY 11.	ASSESS RESULTS OF ENGAGEMENT
ACTIVITY 12.	ENGAGE TARGET USING LOADER'S M240 MACHINE GUN
ACTIVITY 13.	IMMEDIATE ACTION MISFIRE
ACTIVITY 14.	EMPLOY SMOKE
	Option 14.1. Employ smoke using M250 smoke grenade launcher
	Option 14.2. Employ smoke using vehicle exhaust smoke system
ACTIVITY 15.	SUBMIT REPORTS

Note. Activities 1-11 were identified by Hoffman and Morrison (1988); activities 12-15 were identified by Morrison, Meade, and Campbell (1990).

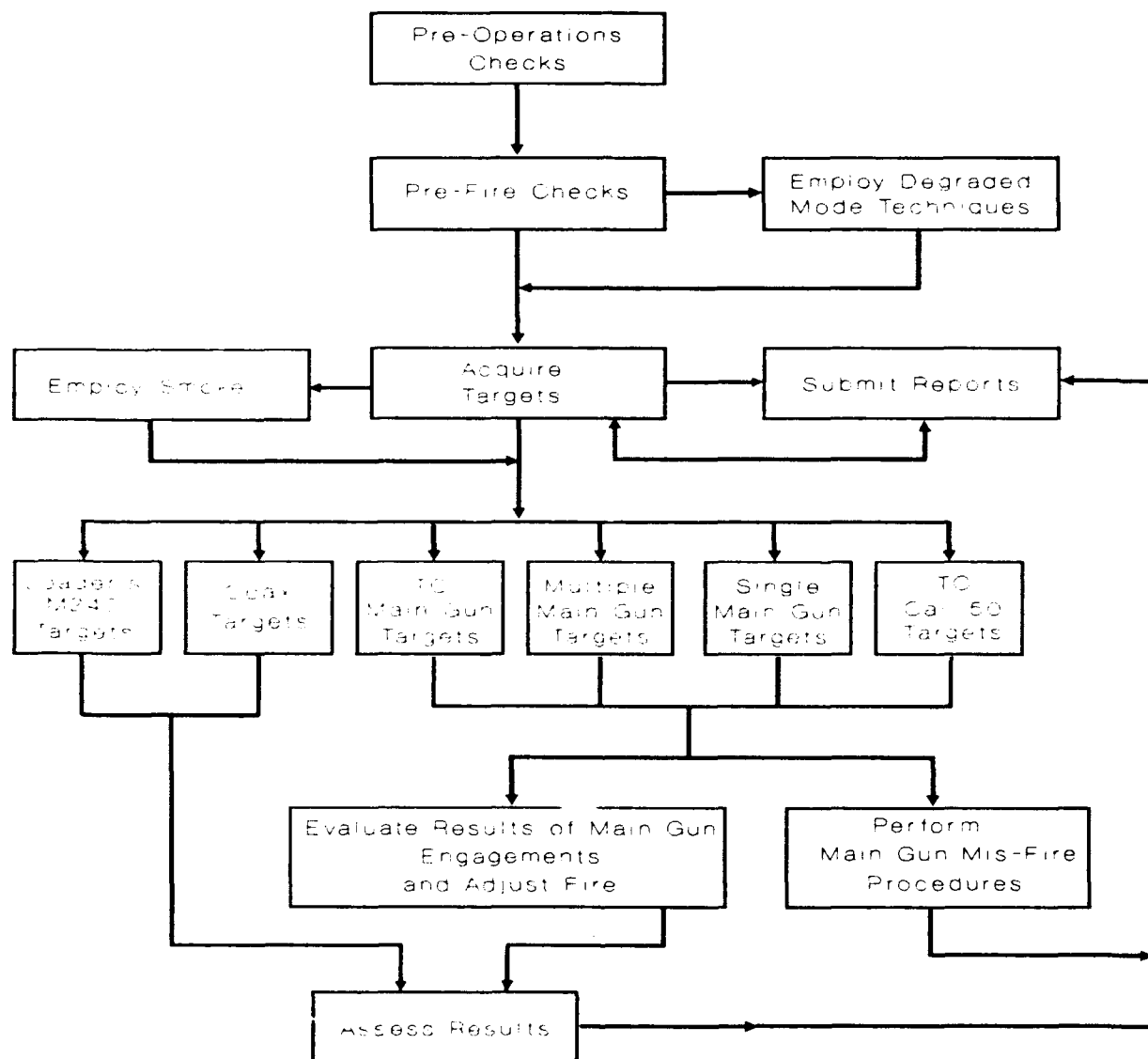


Figure 1. Optional sequences for performing crew-level tactical gunnery activities. Adapted from "Requirements for a Device-Based Training and Testing Program for M1 Gunnery: Volume 1. Rationale and Summary of Results" by R. G. Hoffman and J. E. Morrison, 1988, U.S. Army Research Institute, Tech. Rep. 783, p. 19.

Table 4

Platoon Leadership and Collective Tactical Gunnery Activities and Options

PLATOON LEADERSHIP ACTIVITIES

ACTIVITY 16. ISSUE TACTICAL REPORTS

ACTIVITY 17. ISSUE PLATOON/SECTION FIRE COMMAND

ACTIVITY 18. REQUEST INDIRECT FIRE

- Option 18.1. Request initial indirect fire
- Option 18.2. Shift/lift fire

ACTIVITY 19. SPECIFY MOVEMENT

- Option 19.1. Specify movement formation
- Option 19.2. Specify movement technique
- Option 19.3. Specify direction

PLATOON COLLECTIVE ACTIVITIES

ACTIVITY 20. TRAVEL IN PLATOON FORMATION

- Option 20.1. Move tactically using wingman concept
- Option 20.2. Execute a herringbone formation
- Option 20.3. Execute a coil formation
- Option 20.4. Execute a wedge formation
- Option 20.5. Execute an echelon formation
- Option 20.6. Execute a line formation
- Option 20.7. Execute a vee formation
- Option 20.8. Execute a column formation

ACTIVITY 21. EXECUTE BATTLE DRILLS

- Option 21.1. Execute action drill
- Option 21.2. Execute contact drill
- Option 21.3. React to air attack
- Option 21.4. React to indirect fire

ACTIVITY 22. BOUND BY SECTION

ACTIVITY 23. OVERWATCH A BOUNDING PLATOON

ACTIVITY 24. OCCUPY A BATTLE POSITION

- Option 24.1. Occupy initial battle position
- Option 24.2. Occupy subsequent battle position

ACTIVITY 25. MANEUVER WITHIN A BATTLE POSITION

ACTIVITY 26. EMPLOY FIRE PATTERNS

- Option 26.1. Employ frontal fire
- Option 26.2. Employ cross fire
- Option 26.3. Employ depth fire

ACTIVITY 27. Employ firing techniques

- Option 27.1. Employ observed fire
- Option 27.2. Employ alternating fires
- Option 27.3. Employ simultaneous fires

Note. The section/platoon-level activities and options were identified by Morrison, Meade, and Campbell (1990) with the exception of the following options, which were added by the present author: (a) move tactically using wingman concept, (b) execute herringbone formation, (c) execute coil formation, and (d) react to indirect fire.

leadership and collective activities used in the present analysis and, where applicable, the options associated with an activity.²

The platoon leadership and collective activities and the actions performed during the conduct of those activities are shown in Appendix B. Many of the platoon-level activities are directly equivalent to official armor tasks presented in the Mission Training Plan for the Tank Platoon, ARTEP 17-237-10-MTP (DA, 1988a). For those activities, the subordinate actions parallel the subtasks that constitute the official armor task. The actions for those activities that are not directly equivalent to any of the official armor platoon tasks were identified through a review of military documents related to armor platoon operations. In Appendix B, the actions that constitute each activity are presented in outline format to mirror the manner in which the subtasks are presented in ARTEP 17-237-10-MTP; the numbers and letters do not necessarily indicate the order in which the actions are to be performed.

Gunnery Knowledges

A list of prerequisite gunnery knowledges was drawn up from Morrison and Hoffman's (1988) analysis of gunnery behaviors. This list was revised to cover the additions to the list of crew-level activities. The prerequisite knowledges required of each tank crewman are shown by activity in Appendix C and are summarized in Table 5. These knowledges provided the training requirement for evaluating the training aid. Because the extant software for the HHT only provides instruction on crew gunnery techniques, the inventory of basic knowledges was not expanded to cover the platoon leadership and collective activities.

Assessment of Device/Aid Capabilities

To evaluate device capabilities and limitations, three researchers familiar with M1 tank gunnery consulted with individuals that were responsible for, or had previously conducted, training on each device and aid. They also examined and operated each device and the aid. The researchers operated production models of TopGun and VIGS, as well as the most recent versions of M-COFT and SIMNET during the period from June - August 1990. A prototype of GUARD FIST I was operated, because production models were not available during the assessment period. Likewise, a prototype HHT and accompanying instructional booklets developed for use by armor crewmen were examined during that period. The following technical documents were also used to assess the devices:

- TopGun TopGun User's Manual. (NKH, 1988).
- VIGS M1/M1A1, Tank Videodisk Gunnery Simulator (VIGS), Device 17-142: Instructor's Utilization Handbook for Simulation Equipment (Revision B). (ECC International, 1988).

²To differentiate the section/platoon-level activities from the crew-level activities, they are numbered starting with Activity 16.

Table 5

Basic Tactical Gunnery Knowledges

Tank Commander	Gunner	Loader	Driver
Locate task in TM and perform task procedures according to instructions.	Locate task in TM and perform task procedures according to instructions.	Locate task in TM and perform task procedures according to instructions.	Locate task in TM and perform task procedures according to instructions.
Identify appropriate battlecarry ammo and battlesight range.	Recall procedures for determining turret/hull defilade.	Identify crew search sectors.	Identify appropriate tank positions during movement.
Identify appropriate tank positions during movement.	Identify crew search sectors.	Demonstrate appropriate search techniques.	Identify routes of movement.
Identify sources of cover and concealment.	Identify appropriate settings for GNR station switches.	Recall function and operation of VV-2.	Identify sources of cover and concealment.
Recall procedures for analyzing terrain.	Recall methods of reporting target location.	Identify target signatures.	Identify primary, alternate, and supplementary positions.
Demonstrate use of map overlay.	Demonstrate appropriate search techniques.	Recall methods of reporting target location.	Recall procedures to drive M1 tank.
Recall elements of appropriate verbal reports/ announcements/ commands	Identify target signatures.	Identify targets as friend/foe/neutral and by nomenclature.	Identify crew search sectors.
Identify primary, alternate, and supplementary positions.	Identify targets as friend/foe/neutral and by nomenclature.	Identify announced ammo.	Demonstrate appropriate search techniques.
Recall procedures for preparing sketch range card.	Recall appropriate procedure for estimating range to target.	Recall function of GUN/TURRET DRIVE switch.	Recall function and operation of VV-2.
Identify crew search sectors.	Recall procedures for operating GNR control handles.	Recall function and operation of ejection guard.	Identify target signatures.
Identify appropriate gun tube orientation.	Identify appropriate aiming point on reticle.	Recall procedures for loading main gun round.	Recall methods of reporting target location.
Demonstrate appropriate search techniques.	Recall operation and function of lase buttons.	Recall procedures for unloading/ storing main gun round.	Identify targets as friend/foe/neutral and by nomenclature.
Identify target signatures.	Recall elements of appropriate verbal reports/ announcements.	Recall elements of appropriate verbal reports/ announcements.	Recall elements of appropriate verbal reports/ announcements.
Recall methods of reporting target location.	Interpret LRF symbols/readout.	Identify appropriate fluid level in replenisher reservoir.	Recall function and operation of SMOKE GENERATOR switch.

(table continues)

Tank Commander	Gunner	Loader	Driver
Identify targets as friend/foe/neutral and by nomenclature.	Recall gunner's standard adjustments.	Recall operation of M240 MG.	
Classify targets by threat.	Recall procedure for applying manual lead.	Recall procedures to perform manual extraction of main gun round.	
Recall appropriate procedure for estimating range to target.	Recall procedures for retrieving/storing data in ballistic computer.		
Identify appropriate weapon, ammo, and firing mode.	Recall procedures for conducting computer self test.		
Recall function and operation of TC control handles.	Interpret output from computer self test.		
Recall TCs standard adjustments.	Determine appropriate compensation for cant.		
Recall function and operation of CWS controls to traverse, elevate, and fire Cal .50.	Recall function and operation of manual traverse/elevation controls.		
Identify aiming point on Cal .50 reticle.	Recall function and operation of MRS		
Recall function and operation of manual range controls.	Recall function and operation of manual firing controls.		
Interpret LRF symbols/readout.			
Recall function and operation of laser buttons.			
Identify aiming point on reticle.			
Recall appropriate reassignment of tank crew duties.			
Identify appropriate pattern of fire for smoke grenades.			
Recall operation of M250 grenade launcher.			

- M-COFT Instructor's Utilization Handbook for the M1 Unit-Conduct of Fire Trainer (U-COFT) (Vol. 1). (General Electric, 1985).

M1 Unit Conduct-of-Fire Trainer (U-COFT) training device support package, FC 17-12-7-1. (U.S. Army Armor Center, 1985).
- GUARD FIST I Guard Unit Armory Device, Full-Crew Interactive Simulation Training--Armor (GUARD FIST I). (Daedaleen, 1990).
- SIMNET SIMNET Users' Guide. (USAARMS, 1989).

SIMNET M-1 Crew Manual. (Perceptronics, 1987).

The capability of the devices to support gunnery training was determined through a series of analyses. These analyses examined the extent to which the devices were able to simulate the tank components and the gunnery conditions and behaviors that constitute the performance domain. The procedures used to assess the devices are described in the next two sections. These descriptions are followed by an explanation of the approach used to assess the capability of the HHT to impart the prerequisite gunnery knowledges. To ensure continuity, all of the assessments were made by the author using (a) detailed notes taken by the researchers during the operation of the devices and aid, and (b) the technical documents cited above.

Tank Components and Gunnery Conditions

The assessment of M1 gunnery-related tank components was conducted by determining whether or not the devices simulated each of the subcomponents that constitute the tank components. Similarly, the assessment of gunnery conditions was conducted by determining whether or not the devices were capable of simulating each of the conditions within the situational parameters. The approach was adapted from the procedure used by Hoffman and Morrison (1988) in their assessment of gunnery conditions supported by devices. Using the inventories of components and conditions, "YES" and "NO" entries were recorded to indicate whether or not individual subcomponents or conditions were represented by the device. In any case where a subcomponent or condition was simulated with less than full fidelity, an entry of "YES" was recorded along with comments describing the differences between the device and the M1 tank. An entry of "NO" was recorded only in cases where the device was incapable of simulating a subcomponent or condition. Finally, ratings for the tank components and situational parameters were derived by calculating the percentage of subordinate subcomponents or conditions simulated by the device. Those percentages were divided into four categories to indicate the degree to which devices supported the various tank components and situational parameters. The four categories were defined as follows:

- Highly supported: All subcomponents/conditions were simulated by the device.

- Partially supported: At least half, but not all, of the subcomponents/conditions were simulated by the device.
- Minimally supported: Less than half, but at least one, of the subcomponents/conditions were simulated by the device.
- Not supported: None of the subcomponents/conditions were simulated by the device.

Gunnery Behaviors

The lists of crew-level and section/platoon-level activities were used to assess the degree to which the devices were capable of supporting training of the behaviors associated with tactical gunnery. The approach used was an adaptation of a procedure used by Burnside (1990) to assess the degree to which armor training standards could be met in SIMNET. For each action within a crew- or section/platoon-level activity, respectively, a rating was provided to indicate the level of device support for training that behavior. The same four rating categories that were used to indicate the degree to which devices were able to simulate the tank components and situational parameters were used to indicate the extent to which the behavioral actions could be performed on the devices, although different definitions were assigned to the categories. The four categories and the characteristics, or criteria, used to define them were as follows:

- Highly supported: All subordinate elements of the action could be performed realistically; the corresponding stimuli were consistent with real world cues.
- Partially supported: At least half, but not all, of the subordinate elements of the action could be performed. And/or all, or at least half, of the elements could be performed realistically, but the remaining elements could not be performed realistically or at all. And/or at least half of the corresponding stimuli were consistent with real world cues, and stimuli that were artificial did not detract from the simulation. That is, even though the stimuli were different, the task could still be adequately trained on the device.
- Minimally supported: More than half of the subordinate elements of the action could not be performed. And/or more than half of the elements could not be performed realistically. And/or more than half of the corresponding stimuli were not consistent with real world cues. That is, the stimuli did not allow for the task to be adequately trained on the device. And/or more than half of the corresponding stimuli were artificial and detracted from the simulation.

- Not supported: None of the subordinate elements of the action could be performed.

Ratings for each activity were derived using the ratings provided for the subordinate actions. These ratings were based on the percentage of actions within an activity that were rated in each category. The four ratings applied to activities and options were defined as follows:

- Highly supported: All of the actions within an activity were highly or partially supported, with more than half of those actions being highly supported.
- Partially supported: At least half, but not all, of the actions within an activity were highly or partially supported.
- Minimally supported: More than half of the actions within an activity were either minimally supported or not supported, with more than half of those actions being minimally supported.
- Not supported: More than half of the actions within an activity were not supported.

Gunnery Knowledges

The assessment of the HHT consisted of examining its courseware to determine whether or not the courseware provided instruction on the prerequisite gunnery knowledges. Using the inventory of basic tactical gunnery knowledges, "YES" and "NO" entries were recorded to indicate whether or not the knowledges were covered by the instruction materials. Because training aids address knowledges rather than skills or behaviors, the HHT was not evaluated with respect to the crew- and platoon-level activities. The acquisition of these basic knowledges, although prerequisite, is not sufficient for the successful performance of the activities. Consequently, the percentage of knowledges within the activities that were covered by the HHT courseware were not calculated.

Results and Discussion

The results of the analyses detailed in the previous section are described in two parts. The first part summarizes the results of the assessments conducted to determine the capability of the devices to simulate the components, conditions, and behaviors required to conduct tactical gunnery. Those summaries are presented graphically in a series of figures. The results of the analysis of basic gunnery knowledges supported by the HHT are also presented. The second part contains a discussion of the general strengths and weaknesses of each device and aid for training tactical gunnery. Because the elements of the gunnery performance domain overlap, separate explications of the results of analyses conducted on those elements would contain redundancies. Therefore, this discussion of device capabilities integrates the results of the three assessments (components, conditions, and behaviors) conducted for each device. The strengths and weaknesses of the

HHT, which were revealed during the analysis of basic knowledges covered by the training aid's current courseware, are also discussed.

Summary of Device/Aid Assessments

Tank Components

The detailed results from the analysis of tank subcomponents are presented in Appendix D by device. A summary of this detailed information is provided by the ratings of the tank components, shown in Figure 2. The two low-cost devices, TopGun and VIGS, replicated few of the tank components required for gunner's to conduct tactical gunnery. Conversely, M-COFT simulated most of the weapons and sights, and all of the commander's and gunner's station controls. Although GUARD FIST I is attached to an actual M1 tank, the device did not allow full use of all of the tank's gunnery-related components. Whereas few of the weapons systems and driver's controls were operational, most of the optic systems and the controls for the other crew station's were serviceable. SIMNET replicated all of the driver's station controls, most of the optic systems and controls in the other three crew stations, and few of the weapon systems.

GUNNERY-RELATED M1 TANK COMPONENTS	DEVICES				
	TopGun	VIGS	M-COFT	GUARD FIST I	SIMNET
Weapons	0	0	●	0	0
Sights/Optics	0	0	●	●	●
Fire System Controls:					
Commander's Station			●	●	●
Gunner's Station	0	0	●	●	●
Loader's Station				●	●
Driver's Station				0	●

Figure 2. Summary of the level of support devices provided for simulating gunnery-related M1 tank components (● = highly supported, ◐ = partially supported, 0 = minimally supported, blank = not supported).

Gunnery Conditions

The results of the analysis of gunnery conditions for each of the devices are presented in Appendix E. Figure 3 shows the level of support each device provided for simulating the situational parameters, which serves as a summary of the analyses presented in Appendix E. All devices simulated at least some conditions within the parameters associated with single-tank gunnery (e.g., target movement, target orientation, target array). SIMNET also simulated at least some conditions within the parameters related to section or platoon operations (e.g., movement formation, space, special engagement requirements). In general, the more expensive the device, the more

SITUATIONAL PARAMETERS	DEVICES				
	TopGun	VIGS	M-COFT	GUARD FIST I	SIMNET
Target Type	0	●	●	0	●
Target Movement	●	●	●	●	●
Target Cover/Concealment	●	0	●	●	●
Target Array	●	●	●	●	●
Target Orientation	●	●	●	●	●
Target Range	●	●	●	●	●
Target Sector	0	0	0	0	●
IFFN	0	0	●	0	●
Enemy Activity	0		0	0	●
NBC Conditions	●	●	●	●	●
Equipment Status	0	0	●	●	0
Number of Crewmen	●	●	●	●	●
Supply Shortages	0	0	0	0	0
Mission	●	●	●	●	●
Fire Control	0	0	0	0	●
Movement Formation					●
Special Engagement Requirements					●
Space					●
Visibility	●	●	●	●	0
Terrain Grade	0	●	●	●	●
Terrain Vegetation	0	●	●	●	●

Figure 3. Summary of the level of support devices provided for simulating gunnery-related situational parameters (● = highly supported, ● = partially supported, 0 = minimally supported, blank = not supported).

conditions it simulated. Thus, the percentage of parameters at least partially supported by the devices was as follows: TopGun (43%), VIGS (52%), GUARD FIST I (57%), M-COFT (67%), and SIMNET (86%).

Gunnery Behaviors

The ratings for all of the actions within the crew-level activities are presented in Appendix F by device and crew position. The information presented in Appendix F is summarized in Figures 4 through 7. Figure 4 summarizes the degree to which each of the five devices supports training of key activities and options as performed by gunners. A summary of the key activities and options performed by TCs on M-COFT, GUARD FIST I, and SIMNET is presented in Figure 5. Finally, Figures 6 and 7 present summaries of the principal activities and options performed by loaders and drivers, respectively, on GUARD FIST I and SIMNET.

The analysis of section and platoon behaviors was limited to SIMNET, because it was the only device to support interactive simulations involving multiple tank simulators. Appendix G shows the ratings for all of the actions within the section/platoon leadership and collective activities. Figure 8 summarizes those ratings by indicating the level of support SIMNET provides for training the primary section/platoon-level activities and options. Because the analysis of gunnery behaviors provided the most information regarding device capabilities to support gunnery training, the results presented in Figures 4-8 are discussed in more detail in the next section on device strengths and weaknesses.

Gunnery Knowledges

The results from the analysis of prerequisite gunnery knowledges covered by the HHT's courseware are shown in Appendix H. The evaluation of the training aid revealed that existing courseware provided instruction on few of the prerequisite knowledges required of armor crewmen. However, the HHT instructional units provided at least some coverage of the following knowledges:

- classify targets by threat;
- recall elements of appropriate verbal commands/reports/announcements;
- identify appropriate weapon, ammo, and firing mode;
- recall elements of appropriate fire command;
- recall TC's standard adjustments;
- interpret laser range finder (LRF) symbols/readout;
- recall operation and function of laser buttons;
- identify appropriate settings for gunner's station switches;
- interpret output from computer self test;
- determine appropriate compensation for cant;
- recall operation and function of manual firing controls; and
- recall gunner's standard adjustments.

As stated previously, this analysis was not conducted with respect to the activities, therefore, a figure summarizing the percentage of knowledges within each activity covered by the HHT courseware is not presented.

GUNNER ACTIVITIES AND OPTIONS	DEVICES				
	TopGun	VIGS	M-COFT	GUARD FIST I	SIMNET
Prepare Stations for Operations (PREOPS)			●	0	0
Perform Prepare-to-Fire (PREFIRE) Checks			●	0	0
Acquire Targets	0	0	●	●	●
Engage Single Target from the Offense Using Precision Gunnery		●	●	●	●
Engage Single Target from the Defense Using Precision Gunnery	●	●	●	●	●
Engage Targets Using TIS	●	●	●	●	
Adjust Fire	●	0	●	●	●
Engage a Single target with the Coax		●	●	●	
Engage Multiple Targets with the Main Gun	●	●	●	●	●
Engage Targets with the Cal .50			●		
Engage Targets Using Battlesight Gunnery			●	●	●
Engage Targets Given Fire System Control Failure ^a	0	0	0	0	0
Engage Targets Using the GAS	●	●	●	●	
Engage Targets in Emergency Mode			●	●	
Engage Targets in Manual Mode			●		
Engage Targets from the TC Position			●	●	●
Assess Results of Engagement			●	●	●
Immediate Action Misfire					

^aIncludes the following failures: ineffective LRF, multiple returns from LRF, loss of GPS symbology, crosswind sensor failure, cant sensor failure, lead angle sensor failure, GPS failure, and GPS/TIS failure.

Figure 4. Summary of the level of support devices provided for training key crew-level activities and options performed by gunners (● = highly supported, ● = partially supported, 0 = minimally supported, blank = not supported).

TANK COMMANDER ACTIVITIES AND OPTIONS	DEVICES		
	M-COFT	GUARD FIST I	SIMNET
Prepare Station for Operation (PREOPS)	●	●	0
Perform Prepare-to-Fire (PREFIRE) Checks	0	0	●
Acquire Targets	0	0	●
Engage Single Target from the Offense Using Precision Gunnery	●	●	●
Engage Single Target from the Defense Using Precision Gunnery	●	●	●
Adjust Fire	●	●	●
Engage a Single target with the Coax	●	●	
Engage Multiple Targets with the Main Gun	●	●	●
Engage Targets with the Cal .50	●		
Engage Targets Using Battlesight Gunnery	●	●	●
Engage Targets Given Fire Control System Failure ^a	0	0	0
Engage Targets Using the GAS	●	●	
Engage Targets in Emergency Mode	●	●	
Engage Targets in Manual Mode	●	●	
Engage Targets from the TC Position	●	●	●
Assess Results of Engagement	●	●	●
Immediate Action Misfire			
Employ Smoke	●		
Submit Reports	●	●	●

^aIncludes the following failures: ineffective LRF, multiple returns from LRF, loss of GPS symbology, crosswind sensor failure, cant sensor failure, lead angle sensor failure, GPS failure, and GPS/TIS failure.

Figure 5. Summary of the level of support devices provided for training key crew-level activities and options performed by tank commanders (● = highly supported, ● = partially supported, 0 = minimally supported, blank = not supported).

LOADER ACTIVITIES AND OPTIONS	DEVICES	
	GUARD FIST I	SIMNET
Prepare Station for Operation (PREOPS)	0	0
Perform Prepare-to-Fire (PREFIRE) Checks	0	0
Acquire Targets		●
Engage Single Target from the Offense Using Precision Gunnery	0	0
Engage Single Target from the Defense Using Precision Gunnery	0	0
Adjust Fire	0	0
Engage a Single Target with the Coax	0	
Assess Results of Engagement		
Engage Target with Loader's M240 Machine gun		
Immediate Action Misfire		

Figure 6. Summary of the level of support devices provided for training key crew-level activities and options performed by loaders (● = highly supported, ○ = partially supported, 0 = minimally supported, blank = not supported).

DRIVER ACTIVITIES AND OPTIONS	DEVICES	
	GUARD FIST I	SIMNET
Prepare Station for Operation (PREOPS)	0	0
Perform Prepare-to-Fire (PREFIRE) Checks	0	●
Acquire Targets	0	●
Engage Single Target from the Offense Using Precision Gunnery	●	●
Engage Single Target from the Defense Using Precision Gunnery	●	●
Adjust Fire	●	●
Engage Single Target with the Coax	●	
Assess Results of Engagement	●	●
Employ Smoke		

Figure 7. Summary of the level of support devices provided for training key crew-level activities and options performed by drivers (● = highly supported, ○ = partially supported, 0 = minimally supported, blank = not supported).

PLATOON LEADERSHIP ACTIVITIES AND OPTIONS	SIMNET
Issue Platoon Tactical Reports	●
Issue Section/Platoon Fire Command	●
Request Indirect Fire	●
Specify Movement	●
PLATOON COLLECTIVE ACTIVITIES AND OPTIONS	
Move Tactically Using Wingman Concept	●
Execute a Stop Formation ^a	●
Execute a Movement Formation ^b	●
Execute Action Drill	●
Execute Contact Drill	●
Execute Air Attack Drill	●
Execute Indirect Fire Drill	●
Bound by Section	●
Overwatch a Bounding Section	●
Occupy Initial Battle Position	○
Occupy Subsequent Battle Position	●
Maneuver within a Battle Position	●
Employ Fire Patterns	●
Employ Firing Techniques	●

^aIncludes coil and herringbone formations. ^bIncludes the following formations: wedge, echelon, line, vee, and column.

Figure 8. Summary of the level of support SIMNET provided for training key section/platoon-level activities and options (● = highly supported, ● = partially supported, ○ = minimally supported, blank = not supported).

Strengths and Weaknesses of the Devices and Aid

TopGun

TopGun supports training of gunner skills associated with engaging single and multiple, stationary and moving main gun targets from the defense. The device represents only a small percentage of the gunnery-related tank components. However, it does simulate the situational parameters and gunnery behaviors necessary to train the basic skills associated with precision gunnery and engagements requiring the use of the GAS or the TIS. Although these skills are but a small part of the tactical gunnery domain, they are

prerequisites for the more complex engagements involving simultaneous targets and degraded modes (fire system control failures). Consequently, TopGun should be given consideration as a gunnery training device for ARNG units. The device's major weaknesses are (a) it does not support training of preops and prefire checks, and (b) it provides little or no support for training skills associated with offensive, machine gun, and degraded mode engagements.

VIGS

Although VIGS supports training of the same gunner skills as TopGun, it also supports training of the additional skills related to engaging targets from a moving tank (offensive engagements) and with the gunner's coaxial machine gun. Also like TopGun, VIGS represents few of the M1 tank components required to perform gunnery engagements, but simulates enough of the conditions and behaviors to support training of the skills required by the basic gunnery engagements (i.e., precision, GAS, and TIS gunnery). The primary shortcomings of the device are that it does not support training of preops and prefire checks, and that it does not adequately simulate the behaviors required to conduct degraded mode engagements.

M-COFT

M-COFT simulates all of the tank components required by the TC and gunner and, accordingly, is capable of training a wide range of gunnery skills needed by TCs and gunners, including a majority of the crew-level gunnery activities. Immediate action misfire is the only activity not supported by M-COFT. The device's failure to support this activity is due primarily to its lack of a loader's station. M-COFT's major strength is that it supports training of activities and options that cannot be trained on any of the other devices. Those activities/options include engaging targets with the caliber .50 machine gun, engaging targets in manual mode, and employ smoke. The device's primary limitations are that it does not simulate the full array of fire system control failures and that it does not adequately simulate a majority of the TC actions associated with prefire checks and target acquisition.

GUARD FIST I

The fidelity of GUARD FIST I is enhanced by its attachment to an M1 tank and its use of many of the tank's actual components. Nevertheless, device controls attached to the vehicle render some of the tank's gunnery-related subcomponents inoperable and reduce the fidelity of others. Like M-COFT, GUARD FIST I simulates a comprehensive array of the tactical gunnery conditions. However, GUARD FIST I supports training of TCs and gunners on fewer of the gunnery activities, primarily because the TC's caliber .50 machine gun is not represented. One of the device's strongest features is that it allows for the simultaneous training of all four crew members. GUARD FIST I provides at least some support for a majority of the activities performed by the loader and driver. Although the level of support for those activities is generally low, the device allows for practice in the essential areas of crew coordination and communication.

SIMNET

Although SIMNET is designed to train tactical skills, it simulates most of the gunnery-related tank components and supports many of the training requirements of tactical gunnery. SIMNET's strongest feature is that it simulates all of the situational parameters to some degree, including the mission-oriented gunnery parameters (e.g., fire control, movement formations) associated with section and platoon gunnery. In addition, like GUARD FIST I, SIMNET allows full-crew interaction. Thus, the device supports both inter- and intra-crew training. With respect to the crew-level activities, although many of the activities are supported, the device suffers from its failure to simulate the coaxial and caliber .50 machine guns, the GAS, the TIS, and most degraded gunnery modes. SIMNET also supports training of all of the section/platoon-level activities, generally at a high level. Its major weaknesses for training those activities are (a) the inability to dismount the vehicle to recon or improve the terrain, (b) the driver's limited field of view, (c) the lack of an open hatch mode, (d) the dearth of adequate cover and concealment in the simulated battlefield, and (d) the absence of prepared firing positions. Some or all of these weaknesses may be eliminated when CCTT is fielded.

HHT

The assessment of the HHT revealed that the training aid's courseware provides instruction on only a small sample of the basic gunnery knowledges. However, the knowledges covered by the aid are vital prerequisites for the successful conduct of gunnery, especially for the TC and gunner. Therefore, the HHT deserves consideration as a technology for training armor gunnery-related knowledges.

Summary and Conclusions

The purpose of this research was to assess the capability of armor devices and aids to support the training of M1 tactical gunnery. Inventories were compiled of (a) the tank components necessary for tactical gunnery, (b) the situational parameters under which gunnery is performed, (c) the behaviors required to conduct tactical gunnery, and (d) the knowledges associated with those behaviors. The lists of components, conditions, and behaviors were used as checklists to determine the extent to which five devices (TopGun, VIGS, M-COFT, GUARD FIST I, and SIMNET) support training of tactical gunnery skills. The list of knowledges was used to assess the HHT's potential as a training aid to impart the prerequisite knowledges associated with tactical gunnery.

A number of conclusions were drawn from the assessment of devices. All of the devices support training of the basic skills required to perform precision gunnery techniques. However, the training requirements necessary to perform secondary gunnery skills (preops and prefire checks) and target acquisition and identification are not adequately simulated by any of the devices. All of the technologies support training of one or more aspects of tactical gunnery and thus warrant consideration in a device/aid-based training strategy. Overall, M-COFT simulates the most comprehensive segment of the tactical gunnery training requirements, and deserves its prominent role in current armor gunnery training (USAARMS, 1988). GUARD FIST I and SIMNET also have the capability to play a large role in a device-based training strategy,

largely because they support full-crew training. The assessment of the potential of the HHT to impart gunnery-related knowledges showed that the aid provides coverage of the knowledges associated with fire commands, crew verbal announcements, target classification, precision gunnery techniques, machine gun techniques, and gunnery techniques for degraded modes.

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Appendix A

Domain of Armor Crew-Level Tactical Gunnery Behaviors

ACTIVITY 1. PREPARE STATIONS FOR OPERATION (PREOPS)^a

TC	GNR	LDR	DVR
Enter TC station	Enter GNR's station	Erect crosswind sensor	Enter DVR's station
Power up CWS/turret	Operate domelight	Install LDR's machinegun	Power up hull systems
Operate domelight	Operate intercom	Enter LDR's station	Operate domelight
Operate intercom	Install coax	Operate domelight	Check turret seal
Adjust seat	Adjust seats/browpads	Power up LDR's station	Operate intercom
Adjust hatch	Adjust chestrest	Operate intercom	Adjust seat/periscopes
Adjust platform	Power up GNR station	Adjust LDR's seat/platform	Adjust hatch
Install TC's weapon	Perform GPS function check	Install LDR's hatch	Operate drain valves
Adjust kneeguard	Adjust CPS	Install/check LDR's night vision viewer	Start engine
Adjust GPSE headrest/lens	Perform computer self-test	Position LDR's guards for firing	Make after-start checks
Operate manual range controls	Perform computer data check	Operate LDR's panel	
Operate power control handle	Perform TIS check	Operate turret traverse lock	
Operate CWS in power/manual modes	Perform GAS adjust	Operate ready ammunition door in auto/manual modes	
	Operate power control handles	Operate semi-ready ammunition door	
	Operate manual elevation/traverse cranks	Operate hull ammunition door	
	Perform lead system check	Stow 105MM ammunition	
	Perform firing circuits check	Operate main gun breechblock	
	Perform crosswind sensor check	Check replenisher	
	Perform hydraulic pressure check		

^aPrepare for Operations (PREOPS) checks are performed with the aid of the Operator's Manual (TM 9-2350-10-2). These procedures are not necessarily performed in the stated order.

ACTIVITY 2. PERFORM PREPARE-TO-FIRE (PRE-FIRE)^a CHECKS

TC	GNR	LDR	DVR
Supervise/assist main gun boresight	Boresight main gun	Clear/load coaxial machinegun	Check fuel tanks
Boresight TC's weapon	Zero coaxial machinegun	Fill ready rack	Report fuel status
Zero TC's weapon	Report weapon status	Report ammo status	
Select/announce battlecarry AMMO, RANGE	Index battlecarry ammo using AMMO SELECT switch	Load battlecarry ammo	
	Introduce battlesight range into CCP		

Option 2.1. Prepare for Offense

Receive offensive
mission/formation/
movement/commo

Analyze terrain

Check map overlay

Brief crew

Receive TC briefing

Receive TC briefing

Receive TC briefing

Control DVR, if
necessary, to
maintain position
in PLT formation
and to exploit
cover and
concealment

Select routes in
accordance with
mission and
formation

^aBoresighting is performed in accordance with procedures outlined in the Tank Gunnery Tables (FM 17-12-1).

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 2.2. Prepare for Defense</u>			
Issue driver commands to move with platoon to occupy battle position			Drive to battle position
Receive defensive mission/position commo			
Prepare primary/alternate/supplementary positions			Rehearse movement between primary and alternate firing positions
Analyze terrain	Inspect terrain through GPS/TIS	Inspect terrain to flank/rear	
Prepare tank sketch card indicating <ul style="list-style-type: none"> . TRPs . key terrain features . sector boundaries . indirect fire locations 	Check GAS clearance <ul style="list-style-type: none"> Learn TRP locations/ranges 		Take primary firing position
			Monitor displays

ACTIVITY 3. ACQUIRE TARGET(S)

Part 3.1. Search for Target(s)

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 3.1.1. Search Open Hatch--Day</u>			
Receive instruction for sector air guard/ATGM guard	Select 3X GPS/TIS magnification		If moving, follow wingman concept/ react to formation changes
Assign responsibility to loader	Search on gun axis using GPS	Perform air guard search (if assigned)	
Orient gun tube	Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS")	Search right front center clockwise to right rear	Search fender to fender
Search left front clockwise to left rear			
Execute search techniques: <ul style="list-style-type: none"> . rapid scan . slow scan . detailed search . flat terrain air search . hilly terrain air search 	Execute search techniques: <ul style="list-style-type: none"> . rapid scan . slow scan . detailed scan 	Execute search techniques: <ul style="list-style-type: none"> . rapid scan . slow scan . detailed search 	Execute search techniques: <ul style="list-style-type: none"> . rapid scan . slow scan . detailed search

<u>Option 3.1.2. Search Closed Hatch--Day</u>			
Search 360°	Select 3X GPS/TIS magnification		If moving, follow wingman concept/ react to formation changes
Perform air guard duties	Search on gun axis using GPS		
	Alternate using GPS with TIS (see Option 4.4: "Engage targets using TIS")	Search right front counter-clockwise to right rear	Search fender to fender
Execute search techniques: <ul style="list-style-type: none"> . Rapid scan . Slow scan . Detailed search . Flat terrain air search . Hilly terrain air search 	Execute search techniques: <ul style="list-style-type: none"> . Rapid scan . Slow scan . Detailed scan . Near scan 	Execute search techniques: <ul style="list-style-type: none"> . Rapid scan . Slow scan . Detailed search . Flat terrain air search . Hill terrain air search 	Execute search techniques: <ul style="list-style-type: none"> . Rapid scan . Slow scan . Detailed search

<u>Option 3.1.3. Search at Night</u>			
Search 360°	Search on gun axis using TIS	Search right front counter-clockwise to right rear using VVS-2 (night vision device)	Search fender to fender using VVS-2 (night vision device)
Use off-center vision			

TC	GNR	LDR	DVR
<u>Part 3.2. Detect/Locate/Identify Target(s)</u>			
Detect target(s)/ signature(s)/ obstacle(s)	Detect target(s)/ signature(s)/ obstacles	Detect target(s)/ signature(s)/ obstacles	Detect target(s)/ signature(s)/ obstacles
Locate target(s) using one of the following methods: . traverse . optics . reference point	Locate target(s) using one of the following methods: . optics . reference point	Locate target(s) using one of the following methods: . clock . sector	Locate target(s) using one of the following methods: . clock . sector
Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature	Identify target(s) making the following determinations: . IFFN . nomenclature
Note number of targets	If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	If target detected, announce LOADER REPORT, <TARGET>, <LOCATION>	If target detected, announce LOADER REPORT, <TARGET>, <LOCATION>
Classify multiple targets as most dangerous, dangerous, or least dangerous			Evaluate cover and concealment
Confirm acquisition report	Confirm acquisition report		
Estimate range to select weapon(s) and to evaluate LRF return	Estimate range to evaluate LRF return		
Send contact reports to platoon leader			

TC

GNR

LDR

DVR

Part 3.3. Evaluate Situation

Decide whether or
not to engage
contingent on the
following factors:

- . platoon mission
- . platoon fire
plan (fire
pattern/firing
technique)
- . platoon leader
command

Select the
appropriate
weapon/
ammunition and the
firing mode
(precision/degraded)
contingent on the
following factors:

- . Target range
- . Target type
(hard/soft,
point/area)
- . Tank status
(ammo,
malfunctions)

Determine crewman
(GNR, TC, LDR) and
type of fire
command (single,
multiple, or
simultaneous)
contingent on the
following factors:

- . Number of
targets
- . Target
classification

ACTIVITY 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN

TC	GNR	LDR	DVR
<u>Option 4.1. Engage Single Target from the Offense Using Precision Gunnery</u>			
Issue contact report: CONTACT <DIRECTION> <TARGET>		Drop down into turret	Monitor TC and platoon leader commands
Decide whether to engage target while moving or from a short halt		Check turret ring	
If engaging from a short halt, issue driver command: DRIVER STOP		Set GUN/TURRET DRIVE switch in EL UNCPL position	If TC announces HALT, stop smoothly
Relay any action drill command		<u>Case 4.1.A.</u> <u>Announced Round Is Not Loaded</u>	If TC does not announce HALT, maintain steady platform
Issue fire command: GUNNER <AMMO> <TARGET>	Set/check switches: · FIRE CONTROL · MODE: NORMAL · LRF: ARM LAST RTN · GPS: 3X · GUN SELECT: MAIN · AMMO SELECT as announced	Move ejection guard to SAFE	If antitank fire is encountered, seek cover and concealment or execute action drill
Lay gun (simultaneous with fire command)		Ensure SAFE light is lit	Alert crew of obstacles
		Open breech	
		Remove incorrect round from chamber, if necessary	
		Open ammo doors	
	Sight through GPS	Stow unwanted round, if necessary	
Release override	Grasp palm switches	Remove correct round from stowage	
Sight through GPSE	Announce IDENTIFIED	Load desired round	
	Switch GPS to 10X	[Continue with Case B:]	
	Lay on center mass of target	<u>Case 4.1.B.</u> <u>Announced Round Is Loaded</u>	
	Begin to track moving target	Move ejection guard to FIRE	
	Listen for driver alerts	Clear recoil path	
	Depress lase button(s) with reticle on target		
Evaluate range display	Evaluate range display		
	Check ready-to-fire and fault symbols		
	Make control lay		

TC	GNR	LDR	DVR
<u>Option 4.1. Engage Single Target from the Offense Using Precision Gunnery (continued)</u>			
Listen for UP	Listen for UP	Announce UP	
Announce FIRE or FIRE, FIRE <ALTERNATE AMMO>	Listen for FIRE Announce ON THE WAY Squeeze trigger(s) with reticle on target		
	Continue tracking	Open ammo doors	

TC	GNR	LDR	DVR
<u>Option 4.2. Engage Single Target from the Defense Using Precision Gunnery</u>			
Issue contact report: CONTACT <DIRECTION> <TARGET>		Drop down in turret Check turret ring	Set TACTICAL IDLE switch to ON Set transmission control to D
Issue fire command: GUNNER <AMMO> <TARGET>	Set/check switches: · FIRE CONTROL · MODE: NORMAL · LRF: ARM LAST RTN · GPS: 3X · GUN SELECT: MAIN · AMMO SELECT as announced	Ensure GUN/TURRET DRIVE switch in POWERED	Release parking brake
Announce DRIVER MOVE OUT, GUNNER TAKE OVER		<u>Case 4.2.A.</u> <u>Announced Round Is Not Loaded</u>	Depress/hold service brake
Lay gun (simultaneous with fire command)	Sight through GPS	Move ejection guard to SAFE	Move to hull defilade position
Release override	Grasp palm switches Look through GAS to determine when gun clears defilade Announce DRIVER STOP Look through GPS	Ensure MAIN GUN STATUS light is lit Open breech Remove incorrect round from chamber, if necessary	Set transmission control to R Depress/hold service brake
Sight through GPSE	Announce IDENTIFIED Switch GPS to 10X Lay on center mass of target Track moving target Depress lase button(s) with reticle on target	Open ammo doors Stow unwanted round, if necessary Remove correct round from stowage Load desired round [Continue with Case B:]	
Evaluate range display	Evaluate range display Check ready-to-fire and fault symbols Make control lay	<u>Case 4.2.B.</u> <u>Announced Round Is Loaded</u> Move ejection guard to FIRE Clear recoil path	
Listen for UP	Listen for UP	Announce UP	
Announce FIRE or FIRE, FIRE <ALTERNATE AMMO>	Listen for FIRE Announce ON THE WAY Squeeze trigger(s) Continue tracking	Open ammo doors	

TC

GNR

LDR

DVR

Option 4.3. GNR Cannot Identify Announced Target

Case 4.3.A. GNR
Fails to Identify
Target(s)

Announces CANNOT
IDENTIFY or does
not respond

Direct GNR onto
target using one
of the following
techniques:

- . use verbal
commands:
 - TRAVERSE
 <LEFT/RIGHT>,
 - STEADY,
 - ON
- . use TRP
- . announce WATCH
 MY TRACERS and
 use CAL .50 to
 point to
 target

OR

Announce FROM MY
POSITION and
proceed as a TC
engagement (see
Activity 10)

Case 4.3.B. GNR
Identifies
Incorrect Target(s)

Announces IDENTIFY
<DIFFERENT TARGET>

If GNR is correct,
issue a correction
to the fire command

If GNR identifies
wrong target, treat
as Case 4.3.A and
proceed

TC	GNR	LDR	DVR
<u>Option 4.4. Engage Target Using TIS</u>			
Engage targets using precision gunnery (Option 4.1 or 4.2)	Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings: . THERMAL MODE: ON . FLTR/CLEAR/SHTR: SHTR . THERMAL MAGNIFICATION: 3 TO 10X . POLARITY SWITCH: WHITE or BLACK HOT, as desired . SENSITIVITY/ CONTRAST/FOCUS for best image Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)	

ACTIVITY 5. ADJUST FIRE

TC	GNR	LDR	DVR
Recover sight picture	Recover sight picture	Set GUN/TURRET drive switch on EL UNCPL	
Observe strike of round	Observe/announce strike of every round using one of the following terms:	Load announced round (Case A Option 4.1)	
If TARGET was observed, determine whether or not target was destroyed	<ul style="list-style-type: none"> . TARGET . LOST . OVER . SHORT . DOUBTFUL 	Move ejection guard to FIRE Clear recoil path Announce UP	

Option 5.1. Use Reengage Technique

	Announce REENGAGING
	Release/reengage palm switches
	Lay center of mass
	Track moving target
Evaluate range	Depress laser button(s) with reticle on target
Announce FIRE	Evaluate range
	Check ready-to-fire and fault symbols
	Announce ON THE WAY
	Squeeze trigger(s) with reticle on target
	Continue tracking

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 5.2. Use Standard Adjustment</u>			
	Observe/announce deflection and range error		
	Release/reengage palm switches		
	Adjust 1 mil in deflection		
	Adjust 200 meters in range		
	Begin to track moving target		
	Announce ON THE WAY		
	Squeeze trigger(s) with aiming point on target		
	Continue tracking		

<u>Option 5.3. Use TC Adjustment</u>			
Issue subsequent fire command to adjust fire .5-3 mils in deflection and .5-2 mils in range (100-450m)	Release/reengage palm switches		
	Apply TC correction		
	Announce ON THE WAY		
	Squeeze trigger(s) with aiming point on target		
	Continue tracking		
If target is destroyed or exposure is too long, command CEASE FIRE			Return to defilade, or alternate position or seek alternate position
If in defensive posture, command DRIVER, BACK UP			

ACTIVITY 6. ENGAGE A SINGLE TARGET WITH THE COAX

TC	GNR	LDR	DVR
Issue fire command: GUNNER COAX <TARGET>	Set/check switches: · FIRE CONTROL MODE: NORMAL · LRF ARM: ARM LST RTN · GPS: 3X · GUN SELECT: COAX	Set GUN/TURRET drive switch on POWERED	Maintain steady platform
Lay gun (simultaneous with fire command)			
Release override	Grasp palm switches Announce IDENTIFIED Switch GPS to 10X Lay center of target Depress lase button(s)		
Evaluate range display	Evaluate range display Listen for FIRE		
Announce FIRE			
	Announce ON THE WAY		
Monitor/evaluate engagement	Fire 20-30 rounds (5-6 tracers) to destroy/suppress point/area targets	Monitor and correct ammo feed	
Command CEASE FIRE	Adjust fire as needed		

ACTIVITY 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN

TC	GNR	LDR	DVR
Issue fire command: GUNNER <AMMO> <NUMBER> <TARGETS>, <RIGHT/LEFT> <TARGET> FIRST	Engage first target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Engage first target using precision gunnery (Option 4.1 or 4.2)			
If first target is not destroyed, adjust fire (Activity 5)	If first target is not destroyed, adjust fire (Activity 5)	If first target is not destroyed, perform LDR's actions as described in Activity 5	If first target is not destroyed, perform DVR's actions as described in Activity 5
If first target is destroyed, announce <NEXT> TARGET	Engage second target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
[Continue until all targets are destroyed]			
Announce CEASE FIRE			

ACTIVITY 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS AND MAIN GUN ENGAGEMENTS)

TC	GNR	LDR	DVR
<u>Option 8.1. Simultaneous Targets</u>			
Issue fire command: GUNNER <AMMO> <TARGET>, FIRE AND ADJUST	Engage main gun target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Continue with Option 8.2	Adjust fire using standard adjustment as described in Option 5.2		
	If target is destroyed, announce TARGET--CEASE FIRE		

<u>Option 8.2. Cal .50 Targets</u>			
Announce: CALIBER .50			
Charge TC's weapon			
Lay weapon for deflection			
Estimate range to target			
Lay CWS sight range line on target			
Adjust fire if needed	Aid in adjusting TC's weapon		
If target is destroyed, announce TC COMPLETE			

ACTIVITY 9. ENGAGE TARGET(S) USING DEGRADED GUNNERY TECHNIQUES

TC	GNR	LDR	DVR
<u>Option 9.1. Engage Target(s) Using Battlesight Gunnery</u>			
Issue fire command: GUNNER BATTLESIGHT <TARGET>	Set/check switches: · FIRE CONTROL MODE: NORMAL · LRF: SAFE · GPS: 3X · GUN SELECT: MAIN · AMMO SELECT: battlecarry ammo	Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)
Depress MANUAL RANGE BATTLE SGT button			
Estimate range to target			Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
If target is outside of $\pm 200\text{m}$ of battlesight range, enter range change using MAN RNG B/S ADD/DROP toggle switch			
Check range readout in GPSE			
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> evaluating LRF display			

TC	GNR	LDR	DVR
<u>Option 9.2. Engage Target Given Ineffective LRF</u>			
If function or is rendered ineffective due to environmental conditions or battlefield obscurants, TC chooses of using one of the following techniques:		Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
<u>Case 9.2.A. Use Battlesight Gunnery</u>			
Engage target using battlesight gunnery (Option 9.1)	Engage target using battlesight gunnery (Option 9.1)		
<u>Case 9.2.B. TC Indexes Range</u>			
Issue fire command: GUNNER <AMMO> <TARGET>	Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		
Estimate range to target	Announce IDENTIFIED		
Index range using MAN RNG B/S ADD/DROP toggle switch			
<u>Case 9.2.C. GNR Indexes Range</u>			
Estimate range to target	Open CCP door		
Issue fire command: GUNNER <AMMO> INDEX <RANGE>	Press RANGE button Enter <RANGE> Press ENTER button Close CCP door		
	Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		
<u>Case 9.2.D. GNR Manually Applies Range</u>			
Engage target using GAS (Option 9.10)	Engage target using GAS (Option 9.10)		

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 9.3. Engage Target Given Multiple Returns from LRF</u>			
Estimate range to target	Depress lase button(s)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Evaluate range display	If multiple return symbol appears in GPS, announce RANGE <IN METERS>		
If range appears incorrect, may instruct GNR to switch LRF setting from ARM 1ST RTN to ARM LAST RTN or v.v.	Switch LRF setting in accordance with TC instructions		
If multiple return symbol appears in GPSE and displayed range is outside $\pm 200m$, take either one of the following actions:			
<u>Case 9.3.A. Gunner Relases</u>			
Announce RELEASE	Relay on target		
	Depress lase button(s)		
<u>Case 9.3.B. TC Corrects Range</u>			
Correct range using MAN RNG B/S ADD/DROP toggle switch			
If displayed range is within $\pm 200m$ of estimated range, announce FIRE	Squeeze trigger(s) with reticle on target		

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 9.4. Engage Target Given No Range Display (Loss of Symbology)</u>			
<u>Case 9.4.A. Little or No Time</u>			
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating range	Engage target using precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
<u>Case 9.4.B. Time Permitting</u>			
Have gunner report range from CCP	Open CCP door Press RANGE button Announce range		
Evaluate range			

<u>Option 9.5. Engage Target Given Crosswind Sensor Failure</u>			
If computer self-test indicates crosswind sensor failure, have the gunner cancel crosswind input	Open CCP door Press CROSSWIND button Press "0" key Press ENTER button Close CCP door	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Engage target using precision gunnery (Option 4.1 or 4.2)	Engage target using precision gunnery (Option 4.1 or 4.2)		

TC	GNR	LDR	DVR
<u>Option 9.6. Engage Target Given Cant Sensor Failure</u>			
If computer self-test indicates cant sensor failure, have the GNR cancel cant input	Open CCP door Press CANT button Press "0" Press ENTER button Close CCP door	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Announce DRIVER STOP			
Engage target using precision gunnery--stationary (Option 4.2 while monitoring GNR's cant correction	Engage target using precision gunnery--stationary (Option 4.2) If tank is not on level ground, compensate by aiming 1 mil high/1 mil opposite direction of cant per 1000 meters in range to target		Move tank to level ground and stop tank

<u>Option 9.7. Engage Target Given Lead Angle Sensor Failure</u>			
If computer self-test indicates lead angle sensor failure, have the GNR cancel lead angle input	Open CCP door Press LEAD button Press "0" key Press ENTER button Close CCP door	Perform LDR's actions as described in precision gunnery (Option 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.2)
Announce DRIVER STOP			Stop smoothly
Engage target using precision gunnery--stationary (Option 4.2) while monitoring lead	Engage target using precision gunnery (Option 4.2) but apply lead to moving target as follows: . 2.5 mils for sabot . 5 mils for HEAT		

TC	GNR	LDR	DVR
<u>Option 9.8. Engage Target Given GPS Failure (Day Channel)</u>			
If no GPS image, have GNR switch to thermal channel and engage targets using TIS (Option 4.4)	Engage targets using TIS (Option 4.4)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)

<u>Option 9.9. Engage Target Given GPS/TIS Failure</u>			
If both GPS and TIS fail, the TC has the choice of using one of the following engagement techniques:		Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
<u>Case 9.9.A. Use GAS with Precision Techniques</u>			
Engage target using GAS gunnery (Option 9.10)	Engage targets using GAS gunnery (Option 9.10)		
<u>Case 9.9.B. Use GAS with Battlesight Techniques</u>			
Engage target using battlesight gunnery (Option 9.1)	Engage target using battlesight gunnery (Option 9.1) but with the GAS instead of the GPS		

TC	GNR	LDR	DVR
<u>Option 9.10. Engage Target Using GAS</u>			
Estimate range to target		Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)
Issue fire command: GUNNER <AMMO> <TARGET> <RANGE>	Set/check switches: · FIRE CONTROL MODE: NORMAL · LRF: SAFE · GUN SELECT: MAIN · AMMO SELECT: as announced · RETICLE SELECT: announced ammo		
Lay gun (simultaneous with fire command)	Sight through GAS		
Release override	Grasp palm switches		
	Announce IDENTIFIED		
	Lay announced range line on target		
	Begin tracking moving target		
	Apply lead to moving target		
Announce FIRE	Listen for FIRE		
	Announce ON THE WAY		
	Squeeze trigger(s) with reticle aiming point on target		
	Continue tracking		

TC	GNR	LDR	DVR
<u>Option 9.11. Engage Target Given Stabilization System Failure (in Emergency Mode)</u>			
Issue fire command: GUNNER <AMMO> <TARGET>	Set/check switches: · FIRE CONTROL · MODE: EMERGENCY · LRF: ARM LAST RTN · GPS: 3X · GUN SELECT: MAIN · AMMO SELECT: as announced	Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
Announce DRIVER STOP	Sight through GPS		Stop smoothly
Lay gun (simultaneous with fire command)			
Release override	Grasp palm switches		
	Announce IDENTIFIED		
	Begin tracking moving target		
	Apply lead to moving target		
Announce FIRE	Listen for FIRE		
	Announce ON THE WAY		
	Squeeze trigger(s) with reticle aiming point on target		
Announce DRIVER, MOVE OUT	Continue tracking		Resume driving

TC	GNR	LDR	DVR
<u>Option 9.12. Engage Target Given Turret Power Failure (in Manual Mode)</u>			
Announce DRIVER STOP	Set/check switches:	Perform LDR's	Stop smoothly
Issue fire command:	· FIRE CONTROL	actions as	
GUNNER <AMMO>	· MODE: MANUAL	described in	
<TARGET>	· GPS: 3X	precision gunnery	
<DIRECTION>	· GUN SELECT: MAIN	(Option 4.1 or	
<RANGE>	· AMMO SELECT: as	4.2)	Perform DVR's
	announced		actions as
			described in
	Sight through GAS		precision gunnery
	Traverse/elevate gun		(Option 4.1 or
	with manual		4.2)
	controls		
	Announce IDENTIFIED		
	Lay announced range		
	line on target		
	Begin tracking		
	moving target		
	Apply lead to moving		
	target		
Announce FIRE	Listen for FIRE		
	Announce ON THE WAY		
	Press elevation knob		
	firing trigger		
	with reticle		
	aiming point on		
	target		
	If gun fails to		
	fire, vigorously		
	turn blasting		
	machine handle 3-4		
	times		
Announce DRIVER MOVE OUT			Resume driving

ACTIVITY 10. ENGAGE TARGET FROM THE TC POSITION^a

TC	GNR	LDR	DVR
Issue one of the following fire commands:		Performs LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	Performs DVR's actions as described in precision gunnery (Option 4.1 or 4.2)
<u>Case 10.A. Gunner</u> <u>Cannot Identify</u> <u>Target:</u> FROM MY POSITION	Set/check switches: FIRE CONTROL MODE: NORMAL TIS: STBY/ON LRF: ARM LAST RTN GPS: 10X GUN SELECT: MAIN AMMO SELECT: as announced		
<u>Case 10.B. Three-Man Crew (No GNR)</u> Announce LOAD <AMMO> Estimate range to target Sight through GPSE Lay on center mass of target Depress laser button Evaluate range display Make control lay Announce ON THE WAY Squeeze trigger Announce CEASE FIRE			

^aIn three-man crew arrangement, TC performs GNR actions as well as his own.

ACTIVITY 11. ASSESS RESULTS OF ENGAGEMENT

TC	GNR	LDR	DVR
Assess battle damage/casualties	Check/adjust MRS	Check replenisher reservoir	
Determine if and how crew should be reorganized to fight in a three-man configuration		Remove spent casings	
Issue SPOTREP			
<u>Case 11.A. Stationary</u>			
Determine whether to move to primary, alternate, or supplementary firing positions			Respond to TC driving commands
Issue driver command			Respond to TC driving commands
<u>Case 11.B. Moving</u>			
Determine changes to route	Index battlecarry ammo		
Issue driver command			
Determine appropriate ammo for anticipated targets	Announce <AMMO> INDEXED	Load announced round as described in precision gunnery (Option 4.1 or 4.2)	
Announce PREPARE BATTLECARRY <AMMO> or RELOAD <AMMO>		Announce loading status	
Enter battlecarry range using the MANUAL BATTLE SGT ADD/DROP toggle switch			

ACTIVITY 12. ENGAGE TARGETS WITH LOADER'S M240 MG

TC	GNR	LDR	DVR
<p>Issues fire command: LOADER, TWO-FORTY, <TARGET> <DIRECTION> <RANGE></p>		<p>Operates M240 MG charging handle</p> <p>Switches safety switch to fire position</p> <p>Aims center mass of target</p> <p>Fires M240 MG in 3-5 round bursts</p> <p>Adjusts aim point from impact of rounds</p> <p>Takes commands from TC</p> <p>Clears MG and places on SAFE upon completion of engagement</p>	

ACTIVITY 13. IMMEDIATE ACTION-MISFIRE

TC	GNR	LDR	DVR
Attempt to fire w/TC power control handle	Attempt to fire w/alternate electrical triggers, and annual device	Rotate round Unload main gun Perform manual extraction	

Note: TC can over-ride gunner's attempt to fire at anytime during the sequence.

ACTIVITY 14. EMPLOY SMOKE

TC	GNR	LDR	DVR
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>			
Issue order to fire smoke	(If given TC command) Traverse turret to firing position	Drop down into turret	Close hatch
Traverse turret to firing position			
Announces: GRENADES LAUNCHER			
Lift safety cover and hold GRENADE READY/SAFE switch to READY			
Announces: SALVO <PATTERN>			
Press left, right or both push buttons to fire grenades from launchers			
Announces: GRENADES LAUNCHED			

<u>Option 14.2. Use Vehicle Engine Exhaust Smoke System</u>			
Issue order to generate smoke			Push switch activating smoke
			Continue at direction of TC

ACTIVITY 15. SUBMIT REPORTS

TC

GNR

LDR

DVR

Operate radio

Transmit report
information

Note: Is tank appended device have the capability with external radio communication, or is reporting independent of the device.

Appendix B

Domain of Armor Section/Platoon-Level Tactical Gunnery Behaviors

PLATOON LEADERSHIP ACTIVITIES

ACTIVITY 16. ISSUE TACTICAL REPORTS

1. Determines that the situation requires that a tactical report (e.g., SITREP, SPOTREP, CONTACT REPORT, etc.) be submitted.
 2. Determines appropriate report to submit.
 3. Analyses the situation to determine the necessary elements of the tactical report to be submitted.
Examines:
 - a. The platoon's mission.
 - b. Location of enemy forces.
 - c. Description of enemy forces.
 - d. Enemy activity.
 - e. Terrain and weather.
 - f. Personnel status.
 - g. Equipment status.
 4. Determines means of communicating tactical report, depending on:
 - a. Availability of communication equipment.
 - b. Security of communications.
 - c. Local requirements.
 - d. The electronic warfare situation.
 5. Submits tactical report using appropriate method communication.
 - a. Wire.
 - b. Messenger.
 - c. FM radio.
-

ACTIVITY 17. ISSUE PLATOON/SECTION FIRE COMMAND

1. Observes or receives report of threat targets.
 2. Analyzes situation to determine if it requires the platoon/section to engage enemy targets or positions.
 - a. Type, range, and movement of threat targets.
 - b. Mission.
 3. Determines necessary elements of platoon/section fire command (some elements are optional).
 - a. Alert the tank(s) to fire.
 - b. Weapon or ammunition to be fired.
 - c. Target description.
 - d. Target location.
 - e. Control.
 - f. Execution.
 4. Issues platoon/section fire command over FM radio.
 5. Terminates engagements by announcing "CEASE FIRE."
 - a. When given order from commander.
 - b. When all enemy targets are destroyed.
 - c. When all the announced ammunition in the fire command has been fired.
-

ACTIVITY 18. REQUEST INDIRECT FIRE

Option 18.1. Request Initial Fire

1. Determines that the situation requires a call for indirect fire.

Case 18.1.1. Simplified Call for Fire

1. Determines that the situation requires immediate suppression.
2. Determines necessary elements for transmission of initial call for fire.
 - a. Uses own call signs to identify self as observer.
 - b. Issues warning order.
 - c. Gives target location.

Case 18.1.2. Standard Call for Fire

1. Determines that the situation does not requires immediate suppression.
 2. Determines necessary elements for first transmission of initial call for fire.
 - a. Uses own call sign to identify self as observer.
 - b. Issues warning order.
 3. Determines necessary elements for second transmission of initial call for fire.
 - a. Gives target location.
 4. Determines necessary elements for third transmission of initial call for fire.
 - a. Gives target description.
 - b. Specifies method of engagement.
 - c. Specifies method of fire control.
-

Option 18.2. Shift/Lift Indirect Fires

1. Shifts indirect fires.
 - a. Spots and announces each round impact as "OVER", "SHORT", "RIGHT", or "LEFT".
 - b. Estimates correction to bring round onto target, using worm formula when determining range and deviation.
 - c. Transmits corrections to FIST.
 - d. Continues corrections until rounds impact on target.
 2. Lifts indirect fires.
 - a. Announces "END OF MISSION".
 - b. Reports effect rounds had upon targets.
 - c. Receives target number from firing element.
-

ACTIVITY 19. SPECIFY MOVEMENT

1. Analyzes situation to determine appropriate formation, technique, and direction of movement.
 - a. Company OPORD or FRAGO.
 - b. Known suspected enemy locations.
 - c. Terrain and weather.
 - d. Platoon's mission.
 2. Determines proper platoon movement formation.
 - a. Wedge.
 - b. Echelon.
 - c. Line.
 - d. Vee.
 - e. Column.
 3. Determines proper platoon movement technique.
 - a. Traveling.
 - b. Traveling overwatch.
 - c. Bounding overwatch.
 4. Determines platoon's direction of movement.
 5. Direct formation, technique, and direction of movement to the platoon,
 - a. Platoon OPORD.
 - b. Verbal command issued over the FM radio.
 - c. Using visual signals.
-

PLATOON COLLECTIVE ACTIVITIES

ACTIVITY 20. TRAVEL IN PLATOON FORMATION

Option 20.1. Move Tactically Using Wingman Concept

1. Lead tank and wingman move and maintain relative positions in formation.
 - a. Both tanks move tactically.
 - b. Wingman keys movements on lead tank.
 2. Gun tubes are oriented in assigned sectors per platoon SOP and movement formation..
 - a. 360° ground and air security is maintained for each tank.
 3. Lead tank and wingman maintain an interval consistent with the mission, enemy, terrain and weather, troops, and time available (METT-T).
 4. Lead tank and wingman use terrain driving techniques.
 - a. Wingman maintains visual contact with the lead tank at all times.
 5. Tank crews maintain radio-listening silence when in the open-hatch position.
-

Option 20.2. Execute Herringbone Formation

1. PL identifies the situation that calls for a hasty halt of the platoon's movement.
 2. PL orders the herringbone formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. Platoon executes the herringbone formation without delay.
 - a. All TCs move to alternate sides of the movement route and orient their tanks' hulls outward.
 - b. Each TC maintains dispersion and proper interval in accordance with METT-T, platoon SOP, and PL's guidance.
 - c. Each TC occupies covered and concealed positions.
 - d. Lead tank orients main gun toward the column's direction of travel.
 - e. Trail tank orients main gun opposite to the direction of travel.
 - f. Other tanks orient main gun toward the flank of the column corresponding to their direction of travel after exiting the route.
 - g. Platoon establishes local security.
 4. If a scheduled halt, the platoon performs required actions.
 - a. Maintenance.
 - b. Resupply.
 5. If an unscheduled halt, the platoon performs required actions.
 - a. Determines cause of halt.
 - b. Informs commander.
 - c. Develops course of action.
 - d. Resumes movement as soon as possible.
-

Option 20.3. Execute a Coil Formation

1. PL hastily recons terrain off of the route of march.
 - a. Selected location for the coil provides the platoon cover and concealment.
 - b. Location permits adequate trafficability.
 - c. Location affords close proximity to the route of movement.
 2. PL orders the coil formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. The platoon executes the coil formation without delay.
 - a. The lead vehicle takes up a position along the direction of travel. This is the 12 o'clock position.
 - b. The second vehicle takes up either the 3 o'clock or 9 o'clock position based on unit SOP.
 - c. The third vehicle takes up either the 9 o'clock or 3 o'clock position based on the second vehicle and unit SOP.
 - d. The fourth vehicle takes up the 6 o'clock position.
 - e. Each TC orients occupies covered and concealed positions to the extent allowed by METT-T.
 - f. Each TC orients his tank's weapon systems outward to provide the platoon 360° security.
 - g. The platoon establishes local security.
 - h. Depending on METT-T, vehicles are sufficiently dispersed in the area available.
-

Option 20.4. Execute a Wedge Formation

1. PL identifies the terrain and situation that require a wedge formation.
 - a. Terrain offers sufficient lateral space, platoon is overwatched by another element, and excellent observation and fires to the front are required. Good observation and fires to the flanks and control are required.
 2. PL orders the wedge formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. The platoon executes the wedge formation without delay.
 - a. PL positions his tank at either the 1 o'clock or 11 o'clock position where he can best control his platoon and according to his SOP.
 - b. The platoon sergeant (PSG) positions his tank opposite the PL at either the 11 o'clock or 1 o'clock position.
 - c. The wingmen take up positions behind and to the outside of their respective section leader.
 - d. Each TC maintains his tank's interval and speed in accordance with METT-T, platoon SOP, and PL's guidance.
 - e. Platoon orients weapon systems to provide security to the front and flanks.
-

Option 20.5. Execute a Echelon Formation

1. PL identifies the terrain and situation that require a echelon formation.
 - a. The platoon is moving as a part of a larger force for which it must screen one flank or is conducting a contact drill where it must bypass an enemy force while providing fires to the front and one flank.
 2. PL orders the echelon formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. The platoon executes the echelon formation without delay.
 - a. PL positions his tank where he can best control the platoon. Normally this will be the lead tank but may be the second.
 - b. The second tank (PL or his wingman) takes up a position, echeloned left or right, behind the lead tank.
 - c. The PSG's tank takes up a position, echeloned left or right, behind the second tank.
 - d. The PSG's wingman takes up a position, echeloned left or right, behind the PSG's tank.
 - e. Each TC maintains his vehicle's lateral dispersion and interval in accordance with METT-T, platoon SOP, and PL's guidance.
 - f. The platoon orients weapon systems to provide fires to the front and in the direction of echelon (to left or right flank).
-

Option 20.6. Execute a Line Formation

1. PL identifies the terrain and situation that require a line formation.,
 - a. Terrain is open, maximum fire power forward is essential, and the platoon must assault a position, cross a danger area, or move on-line to occupy a defensive overwatch position.
 2. PL orders the line formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. The platoon executes the line formation without delay.
 - a. PL positions his tank where he can best control the platoon.
 - b. PSG positions his tank to the left or right and abreast of the PL's tank as per platoon SOP.
 - c. The wingmen take up positions to the outside of and abreast of their respective section leaders.
 - d. Each TC maintains his vehicle's lateral dispersion and interval in accordance with METT-T, platoon SOP, and PL's guidance.
 - e. The platoon orients weapon systems to provide fires to the front.
-

Option 20.7. Execute a Vee Formation

1. PL identifies the terrain and situation that require a vee formation.
 - a. Excellent protection and control are required, but maximum fires to the front are not necessary. Sufficient space exists for lateral dispersion of the lead section.
 2. PL orders the vee formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 3. The platoon executes the vee formation without delay.
 - a. PL moves his tank to the 3 o'clock or 9 o'clock position while his wingman moves his tank to the opposite side (9 o'clock or 3 o'clock).
 - b. PSG moves is tank to the 5 o'clock or 7 o'clock position while his wingman moves his tank to the opposite side (7 o'clock or 5 o'clock).
 - c. The trailing section ensures that, if the lead sections masks its fires or moves out of range of its weapon systems, it adjusts its position or informs the lead section to adjust or slow its movement.
 - d. Each TC maintains his vehicle's interval and speed in accordance with METT-T, platoon SOP, and PL's guidance.
 - e. The platoon orients weapon systems to provide security to the front and flanks.
-

Option 20.8. Execute a Column Formation

1. PL orders the column formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. TCs acknowledge the PL's signal or radio message.
 2. The platoon executes the column formation without delay.
 - a. The PL positions his tank where he can best control his element.
 - b. Lead vehicle's TC is thoroughly briefed on the route of march or is familiar with it.
 - c. All TCs ensure their vehicle maintains interval and speed in accordance with PL's guidance or platoon SOP.
 - d. The platoon orients weapon systems to provide 360° security. The last tank orients its gun tube to the rear if the platoon is the last in a company team column or if the platoon is operating independently.
-

ACTIVITY 21. EXECUTE BATTLE DRILLS

Option 21.1. Execute Action Drill

Case 21.1.1. Contact

1. After a contact report is given, the PL chooses the action drill.
 - a. Because the enemy has antitank weapons.
 - b. Because the platoon is on the move without immediate cover and concealment from the enemy's fires.
 - c. Because the platoon must orient its frontal armor toward the enemy to prevent possible flank shots.
 - d. Because the platoon must mass its firepower and shock effect to overwhelm the enemy force.
2. The PL determines the direction that the platoon needs to move in and directs the action drill.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
3. The platoon executes the action drill in the direction given.
 - a. All vehicles come on line in the direction given.
 - b. All vehicles take evasive action, as necessary, to avoid enemy fire.
 - c. All vehicles move to and occupy the nearest, covered and concealed, hull-down position in the direction given.
 - d. All vehicles orient weapon systems on enemy position and prepare to fire as directed.
4. If given fire command, the platoon continues to return fire to suppress or destroy the enemy.

Case 21.1.2. Non-Contact

1. PL determines terrain or obstacles require a rapid change in the platoon's direction of movement.
 2. PL determines the direction that the platoon needs to move and directs the action drill.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 3. The platoon executes the action drill in the direction given.
 - a. All vehicles come on line in the direction given.
 - b. All vehicles continue to move, on line, in the direction given.
 4. PL directs the platoon to return to the original formation.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. Uses the wingman concept to orient the platoon by moving his own vehicle in the new direction.
-

Option 21.2. Execute Contact Drill

1. After the contact report is given, the PL chooses the contact drill if:
 - a. The enemy does not require a change in the unit's mission (i.e., enemy does not have antitank weapons).
 - b. The enemy has not identified the platoon, and the PL wants to bypass their position.
 - c. The platoon has orders to bypass small enemy forces.
 - d. PL does not want to change the direction, speed, or technique of movement of the platoon.
 - e. The platoon or section is stationary in an overwatch position and needs to return fire without moving.
 2. PL directs the contact drill.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 3. The platoon executes the contact drill.
 - a. Continues to move along the axis of movement and maintains proper formation and technique of movement.
 - b. Continues to fire using a fire pattern of frontal (Activity 26.1) and a fire technique of simultaneous (Activity 27.3).
 - c. If the platoon is in an overwatch position, it fires to suppress or destroy the enemy using a fire pattern of frontal (Activity 26.1) and a fire technique of simultaneous (Activity 27.3).
-

Option 21.3. React to Air Attack

1. The vehicle that identifies the enemy aircraft beginning its run at the platoon alerts the platoon with a contact report.
 2. If the PL determines that the platoon is in the direct path of the enemy aircraft and if it appears that the platoon is the target of the aircraft's run, he orders an air attack drill.
 - a. Uses the proper hand-and-arm signal, or
 - b. Uses proper voice command on the FM radio.
 - c. Based on METT-T, determines if the platoon should return fire at the attacking aircraft and, if necessary, orders the platoon to fire.
 3. The platoon executes the air attack drill.
 - a. All exposed vehicles in the direct path of flight move away from the path of flight, as fast as possible, along a 45° angle, toward the attacking aircraft.
 - b. Vehicles maintain at least 100-meter intervals and avoid creating a linear targets for the attacking aircraft.
 - c. If the PL orders the platoon to fire, all vehicles fire at the attacking aircraft using the appropriate engagement technique (main gun or machine gun).
 - d. All vehicles move quickly to cover and concealment and halt their movement.
 - e. Vehicles remain in the covered and concealed positions at least 60 seconds after the first flight of the aircraft has passed.
 - f. All vehicles scan for follow-on aircraft.
-

Option 21.4. React to Indirect Fire

1. The platoon is on the move and must react to indirect fires.
 - a. Immediately upon observing indirect fires, the platoon executes evasive action to avoid the impact area.
 - b. Crews drop down inside of the vehicles and close hatches and vision blocks.
 - c. Based on the enemy's expected use of chemical weapons and the type of rounds impacting, all personnel stop breathing and mask.
 - d. Platoon continues to move out or away from the impact area.
 2. The platoon is stationary and must react to indirect fires.
 - a. Immediately upon observing the indirect fires, the platoon crews drop down inside the vehicles and close hatches and vision blocks.
 - b. Based on enemy's expected use of chemical weapons and the type of rounds impacting, all personnel stop breathing and mask.
 - c. If the indirect fire effectively suppresses the platoon's position and mission allows, the platoon moves out of the impact area to adequate cover.
 - d. If the platoon is in defensive positions and the mission does not allow for movement, the platoon moves to turret-down positions and remains in position to continue their mission.
 3. PL sends a spot report to the commander.
 4. Once the indirect fires stop
 - a. The platoon opens vision blocks.
 - b. The platoon remains masked or employs overpressurization system, if equipped.
 - c. The NBC vehicle monitors for NBC conditions as necessary.
 - d. PL initiates unmasking procedures if conditions permit.
 - e. The platoon continues with the unit's mission.
-

ACTIVITY 22. BOUND BY SECTION

1. Based on METT-T, the platoon leader (PL) determines the situation requires bounding overwatch.
 - a. Threat is expected.
 - b. Overwatch by another unit is not available.
 2. PL orders bounding overwatch technique of movement.
 - a. Gives proper hand-and-arm signal, points to the section that will make the first bound and its general axis of movement, or
 - b. Gives the proper voice command or code word over the FM radio for the technique of movement, designates which section is to bound and which section is to overwatch, and gives other specific information, if necessary.
 3. The overwatch section immediately occupies the overwatch position.
 - a. Uses covered and concealed hull-down positions.
 - b. Orients weapon systems on known or suspected threat positions.
 - c. Reports when set to the bounding section's leader.
 - d. Observes terrain that dominates the bounding sections's axis of movement for possible threat contact.
 - e. Continuously observes the bounding section's movement.
 4. The bounding section, once the overwatch section reports set, begins its movement to the subsequent overwatch position.
 - a. Moves at maximum safe speed (dependent on terrain and visibility) on the covered and concealed route to the subsequent overwatch position.
 - b. Orients weapon systems on known or suspected threat positions.
 - c. Continuously observes the terrain for possible threat elements.
 - d. Reports when set in subsequent overwatch position.
-

ACTIVITY 23. OVERWATCH A BOUNDING PLATOON

1. PL commands platoon.
 - a. Selects and assigns covered and concealed firing positions.
 - b. Assigns sectors of observation/fire.
 - c. Visually checks, or orders visual check of, security of the position.
 - d. Reports when set to team leader.
2. Platoon occupies the overwatch position.
 - a. Occupies covered and concealed hull-down positions.
 - b. Orients weapon systems on known or suspected threat positions.
3. Platoon searches for targets.
 - a. Focuses observation on probable threat locations, not on bounding element.
 - b. Uses thermal sights to detect heat sources not visible to the naked eye.
4. Platoon engages targets.
 - a. PL alerts bounding element if engaged by threat.
 - b. Platoon engages targets immediately, without waiting for fire command, whether targets are most dangerous or not.
 - c. Once targets are engaged, PL controls and distributes fires using a fire command.

ACTIVITY 24. OCCUPY A BATTLE POSITION

Option 24.1. Occupy Initial Battle Position

1. The platoon moves to the rear or flanks of the assigned BP.
 - a. Moves into a hide position behind the BP, forms a coil or herringbone, and conducts a simultaneous shutdown.
 - b. The PSG, ICs, and security personnel dismount their vehicles, move to the BP, and report to the PL.
 - c. The PL establishes local security by emplacing the OP(s).
2. The PL leads the platoon in a reconnaissance of the BP. The PL points out terrain that corresponds to the platoon's and company's graphic control measures and briefs the scheme of maneuver.
 - a. PL shows location of company BP, company target reference points (TRPs), and engagement areas.
 - b. PL shows limits of platoon BP and platoon's sector of fire.
 - c. PL points out locations of artillery preplots.
 - d. PL identifies primary and supplementary firing positions and sectors of fire.
 - e. PL points out covered and concealed routes between primary and supplementary firing positions.
 - f. PL points out covered and concealed routes in and out of the primary BP to the subsequent BP.
 - g. PL shows locations for OPs to provide observation of the avenues of approach into the platoon's portion of the company team sector.
 - h. PL indicates locations of existing obstacles and positions for reinforcing obstacles.
 - i. PL briefs ICs on tentative plan.
3. PL makes decisions and completes the plan.
 - a. PL briefs the platoon OPORD within the "1/3 - 2/3 time rule."
4. The platoon occupies the BP.
 - a. Uses hand-and-arm signals and starts vehicles simultaneously.
 - b. Moves forward to occupy turret-down positions and scans sectors of fire.
 - c. Moves forward to hull-down positions.
 - d. Prepares range cards or sector sketches and firing positions.
 - e. Vehicles move to hide positions individually upon completion of range cards or sector sketches, and engines are shut down.
 - f. PL consolidates range cards and readjusts tanks as necessary.
 - g. PL reports established to company team commander.
 - h. PL submits platoon fire plan to commander.
5. The platoon improves the position.
 - a. Camouflages vehicles and equipment.
 - b. Clears fields of fire, as necessary.
 - c. Establishes a platoon hot loop.
 - d. Improves the OP positions.
 - e. Employs chemical agent alarms based on METT-T and unit SOP.
 - f. Employs platoon early warning system (PEWS) to flanks and rear based on METT-T and unit SOP.
 - g. Emplaces obstacles.
 - h. Rehearses displacement, contingencies, and crew drills.
 - i. Assists in survivability effort.
6. PL inspects each vehicle's position.
 - a. Ensures maximum use of cover and concealment.
 - b. Ensures maximum observation and fields of fire.
 - c. Ensures that camouflage blends into the background and foreground.
7. PL inspects range cards or sector sketches and supervises preparation of the BP.
 - a. Ensure that intervisibility and dead space problems are minimized by overlapping fields of observation and fires, and that TRPs, artillery preplots, obstacles, and engagement areas are covered by observation and fires.
 - b. Ensures that TRPs are marked for easy reference by platoon.
 - c. Ensures that firing positions are shifted, as necessary, to cover dead space.
8. PL develops up an obstacle plan.
 - a. The planned obstacle(s) denies dead space to the Threat.
 - b. The planned obstacle(s) funnels and turns the Threat into sectors of fire to create flank shots.
 - c. The planned obstacle(s) slows Threat movement.
 - d. The planned obstacle(s) denies the Threat covered and concealed firing positions within the engagement area.
 - e. The planned obstacle(s) can be feasibly emplaced by the platoon in its current status.

9. The platoon continues to prepare the defense in depth.
 - a. The platoon prepares or reconnoiters subsequent battle positions, as specified in the order.
 - b. Completes obstacle emplacement.
10. The PL links up with the adjacent PL to conduct coordination of the defense.
 - a. Arrives at the time and location specified by the company team leader.
11. The PL exchanges required information with flank units.
 - a. Points out routes into and out of their battle positions and routes back to subsequent battle position or assembly area, if applicable.
 - b. Compares indirect fire targets and adds those targets from the adjacent platoon to plan, as necessary.
 - c. Points out locations of their primary, alternate, and supplementary battle and fighting positions and locations of flank vehicles.
 - d. Points out locations of OPs, routes of patrols, and dead space between platoons and works out how to cover it.
 - e. Exchanges SGP information.
 - f. Ensures overlapping fields of observation and direct fire exist between platoons.
 - g. Exchanges information regarding the locations and types of obstacles employed in respective sectors of fire.
12. PL or company team commander resolves conflicts between platoons.
 - a. Remaining within the guidance and intent of the commander, the PL modifies his plan to resolve conflicts with adjacent platoon's plan.
 - b. Any conflict not resolved by the PLs is brought to the company team commander's attention.
13. PL returns to the platoon and disseminates any changes to the defensive plan resulting from the coordination.
 - a. All appropriate platoon members are briefed on the plan's changes.
14. The platoon incorporates changes to the plan.
 - a. Vehicle fighting positions, sector limits, positions of OPs, patrol routes, and obstacle locations are altered, as necessary to incorporate the changes to the defensive plan resulting from the coordination.
 - b. Rehearsals are conducted that incorporate any changes to the scheme of maneuver, as necessary.

Option 24.2. Occupy Subsequent Battle Positions (Displace to a subsequent battle position)

1. PL acknowledges the commander's order to displace, and begins preparing for the move.
 - a. Authenticates the order if it is a change from the OPORD or if there is doubt about its authenticity.
 - b. Based on METT-T and platoon SOP, PL determines which section within the platoon will displace first. (This is only necessary if the platoon's move is not overwatched by another unit.)
 - c. PL directs that wounded and dead crew members be evacuated by different vehicles.
 - d. PL directs that inoperative vehicles within the platoon are recovered, evacuated, or destroyed to prevent Threat capture.
 - e. PL issues a FRAGO to the platoon to displace by section or simultaneously.
2. The platoon begins its displacement.
 - a. If the platoon's displacement is overwatched by another platoon, all TCs acknowledge the PL's order to displace. If the platoon's move is not overwatched, PSG acknowledges the order to either begin his section's displacement or overwatch as the PL's section begins its move.
 - b. If the displacement is overwatched, each tank in the platoon simultaneously backs down into individual hide positions. If the move is not overwatched, the section to move first backs down to a hide position before turning to leave the BP.
 - c. The platoon, if the move is overwatched, or the moving section, if the move is not overwatched, orients gun tubes on last known Threat contact.
 - d. The platoon, or the moving section, begins displacing along covered and concealed routes to subsequent BP using traveling technique of movement.
3. If the displacement is not overwatched, the section that remains on the BP overwatches the moving section.
 - a. Overwatch section continues to engage the Threat until the other section has backed off the BP.
 - b. Once the first section is clear of the BP, the overwatch section backs down to a hide position before turning to leave the BP.
 - c. Overwatch section orients gun tubes on last known Threat contact.

- d. Overwatch section begins displacing along covered and concealed routes to subsequent BP using the traveling technique of movement with the section.
 - e. Based on METT-T, overwatch section employs smoke generators to screen movement.
4. If the displacement is not overwatched by another platoon, and once both sections are on the move, the platoon uses traveling overwatch, with the first section to displace now becoming the overwatch section.
- a. Overwatch section takes temporary halts, as necessary, to cover the trail section, without blocking or halting the trail section's movement.
 - b. Train (traveling) section continues to move without passing the lead (overwatch) section.
 - c. PL and PSG perform fire distribution and control, as necessary, to cover the platoon's movement.
 - d. PL or PSG, once the last section is clear of the BP and based on METT-T, calls for indirect fires to screen movement and suppress assaulting Threat forces.
5. The lead (overwatch) section approaches and enters the subsequent BP from the flanks or rear and begins its occupation.
- a. If the BP has been prepared or reconnoitered prior to occupation, the section immediately moves to its designated turret-down positions and scans sector for advancing Threat forces.
 - b. On order of its section leader, the lead section moves to a hull-down position and overwatches the trail section.
 - c. If the BP has not been prepared or reconnoitered, the lead section conducts a hasty occupation of the BP and identifies primary firing positions for the trail section.
 - d. PL or PSG with the lead section performs fire distribution and control to cover the trail section.
6. The trail section continues to move and approaches the subsequent BP from the flanks or rear.
- a. If the BP has been prepared or reconnoitered, the trail section immediately moves to its designated turret-downs.
 - b. If the BP has not been prepared or reconnoitered, the trail section takes directions from the section leader on the BP to move to his left or right and occupy hide positions behind selected primary firing positions.
 - c. The trail section occupies turret-down positions or remains in hide positions, based on Threat situation to the front.
 - d. The trail section scans sector for advancing Threat forces.
7. If the BP has not been prepared or reconnoitered prior to the occupation, the PL directs a hasty occupation.
- a. PL orders the platoon into turret-down, optics-up defilade or hull-down positions, depending upon METT-T.
 - b. PL identifies and points out TRPs or EA.
 - c. PL designates primary and supplementary firing positions and sectors of fire.
 - d. PL designates covered and concealed displacement routes in and out of the BP to subsequent BPs.
8. The platoon adjusts positions, as necessary, to occupy the primary firing positions designated by the PL.
- a. TCs select alternate firing positions.
 - b. TCs select covered and concealed routes between primary, alternate, and supplementary firing positions.
 - c. PSG signals the PL when his section is ready.
9. The platoon continues its defense.
- a. PL immediately issues a platoon fire command to engage Threat forces in its sector when engagement criteria are met.
 - b. If there is no Threat contact, the PL orders the platoon to turret-down (or hide positions when OPs are posted) and continues to improve the position by executing the additional steps of a deliberate occupation.
-

ACTIVITY 25. MANEUVER WITHIN BATTLE POSITION

1. PL identifies situation that calls for movement to alternate firing positions.
 - a. When enemy is returning accurate antitank fire.
 - b. When directed to move by the commander.
2. PL determines if there is a need to mask the platoon's movement.
 - a. Emplace of obstacles.
 - b. Generate smoke.
 - c. Call for indirect fire.
 - d. Call for other fire support.
3. PL determines platoon's technique of movement based on:
 - a. Location of alternate firing positions.
 - b. Terrain and weather.
 - c. Enemy position and fires.
4. PL directs platoon to move to alternate firing positions.
 - a. Verbal command issued over the FM radio.
 - b. Using visual signals.
5. The platoon rapidly moves to alternate firing positions using appropriate movement technique.
6. Once the enemy has been destroyed, the PL directs the platoon to shift back to primary firing positions.

Case 25.1. Maneuver by Platoon

1. All tanks simultaneously engage the enemy.
2. After engaging enemy, all tanks move to as a platoon element to alternate firing positions.

Case 25.2. Maneuver by Sections

1. PL designates a section firing section and a maneuver section.
2. The firing section engages enemy targets while the maneuver section moves to alternate firing position.
3. The section that has moved engages enemy while the other section moves to the alternate firing position.

Case 25.3. Maneuver within Sections

1. The PL and his wingman alternate firing and moving.
 2. The PSG and his wingman alternate firing and moving.
 3. The tanks in each section continue to alternate firing and moving until they occupy alternate firing positions.
-

ACTIVITY 26. EMPLOY FIRE PATTERNS

Option 26.1. Employ Frontal Fire

1. PL identifies situation that calls for frontal fire pattern.
 - a. Enemy is dispersed laterally in relation to the platoon and all tanks are firing to the front.
 2. PL orders frontal fire pattern.
 - a. Gives proper fire command using the FM radio.
 - b. May specify frontal as the control element, or a portion of the control element.
 3. Platoon executes frontal fire pattern by engaging the appropriate targets.
 - a. Within their sector, tank engage targets near to far and most dangerous to least dangerous.
 - b. Far-left tank engages the left-most target.
 - c. Far-right tank engages the right-most target.
 - d. The two center tanks engage targets to their direct front.
 4. Platoon shifts fires.
 - a. Tanks on the left and right flanks shift fires toward center.
 5. Platoon continues frontal fire until:
 - a. All targets are destroyed, or
 - b. PL gives a fire command specifying a different firing pattern.
-

Option 26.2. Employ Cross Fire

1. PL identifies situation that calls for cross fire pattern.
 - a. Enemy is exposed laterally but obstructions prevent all tanks from firing to the front.
 2. PL orders cross fire pattern.
 - a. Gives proper fire command using the FM radio.
 - b. Specifies cross as the control element, or a portion of the control element.
 3. Platoon executes cross fire pattern by engaging the appropriate targets.
 - a. Far-left tank engages the right-most target.
 - b. Far-right tank engages the left-most target.
 - c. The two center tanks engage targets diagonal to their own positions.
 - d. PL may choose to engage most dangerous to least dangerous targets or to engage designated priority targets.
 4. Platoon shifts fires.
 - a. Tanks on the left and right flanks shift fires toward center.
 5. Platoon continues frontal fire until:
 - a. All targets are destroyed, or
 - b. PL gives a fire command specifying a different firing pattern.
-

Option 26.3. Employ Depth Fire

1. PL identifies situation that calls for depth fire pattern.
 - a. Enemy is exposed in column formation.
 2. PL orders cross depth fire pattern.
 - a. Gives proper fire command using the FM radio.
 - b. Specifies depth as the control element, or a portion of the control element.
 3. Platoon executes depth fire pattern by engaging the appropriate targets.
 - a. Far-left tank engages the rear target.
 - b. Left-center tank engages a center target.
 - c. Far-right tank engages a center target.
 - d. Right-center tank engages the front target.
 4. Platoon shifts fires.
 - a. Far-left tank shifts fire toward the center of the enemy formation.
 - b. Left-center tank shifts fire towards the rear of the enemy formation.
 - c. Far-right tank shifts fire toward the front of the enemy formation.
 - d. Right-center tank shifts fire toward the center of the enemy formation.
 5. Platoon continues frontal fire until:
 - a. All targets are destroyed, or
 - b. PL gives a fire command specifying a different firing pattern.
-

ACTIVITY 27. EMPLOY FIRING TECHNIQUES

Option 27.1. Employ Observed Fire

1. PL identifies situation that calls for observed fire.
 - a. Platoon is in protected defensive positions and engagement ranges are in excess of 2000 meters.
 2. PL orders observed fire.
 - a. Gives proper fire command using the FM radio.
 - b. Specifies observed as the control element, or a portion of the control element.
 3. Platoon executes observed fire.
 - a. First tank (PL or platoon sergeant) engages designated targets.
 - b. Second tank (wingmen) observes fire.
 4. Second tank prepares to fire in the event that the first tank misses consistently, experiences a malfunction, or runs low on ammunition.
 5. Platoon continues simultaneous fire until:
 - a. All targets are destroyed, or
 - b. PL gives a fire command specifying a different firing technique.
-

Option 27.2. Employ Alternating Fires

1. PL identifies situation that calls for alternating fires.
 - a. Platoon is in defensive position.
 - b. Platoon is undetected.
 2. PL orders alternating fires.
 - a. Gives proper fire command using the FM radio.
 - b. Specifies alternating as the control element, or a portion of the control element.
 3. Platoon executes alternating fires.
 - a. Wingmen engage their outside targets, PL and platoon sergeant observe fire.
 - b. Then, PL and platoon sergeant engage their outside targets, wingmen observe fire.
 4. Platoon continues alternating fires until:
 - a. All targets are destroyed, or
 - b. PL gives command for simultaneous fire.
-

Option 27.3. Employ Simultaneous Fires

1. PL identifies situation that calls for simultaneous fire.
 - a. Platoon is conducting offensive engagement while moving unprotected, or
 - b. Platoon is surprised by enemy targets, or
 - c. During defensive engagement, platoon encounters enemy array numerous enough to require multiple engagements by each tank.
 2. PL orders simultaneous fire.
 - a. Gives proper fire command using the FM radio.
 - b. Specifies simultaneous as the control element, or a portion of the control element.
 3. Platoon executes simultaneous fire.
 - a. All tanks simultaneously engage targets in their assigned sector.
 - b. All tanks observe their own fire.
 4. Platoon continues simultaneous fire until:
 - a. All targets are destroyed, or
 - b. PL gives a fire command specifying a different firing technique.
-

Appendix C

M1 Tactical Gunnery Crew Knowledges by Activity

ACTIVITY 1. PREPARE STATIONS FOR OPERATIONS (PREOPS)^a

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions

^aCrewmen are encouraged to perform the elements associated with PREOPS using the Technical Manual (TM).

ACTIVITY 2. PREPARE TANK TO FIRE (PREFIRE CHECKS)*

TC	GNR	LDR	DVR
Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions	Locate task in TM and perform task procedures according to instructions
Identify appropriate battlecarry ammo and battlesight range			
<hr style="border-top: 1px dashed black;"/>			
<u>Option 2.1. Offense</u>			
Identify appropriate tank positions during movement			Identify appropriate tank positions during movement
Identify sources of cover and concealment			Identify routes of movement
Recall procedures for analyzing terrain	Recall procedures for determining turret/hull defilade		
Demonstrate use of map overlay			
Recall elements of appropriate verbal commands to guide DVR			
<hr style="border-top: 1px dashed black;"/>			
<u>Option 2.2. Defense</u>			
Identify appropriate tank positions during movement			Identify appropriate tank positions during movement
Identify sources of cover and concealment			Identify sources of cover and concealment
Identify primary, alternate and supplementary positions			Identify primary, alternate, and supplementary positions
Recall procedures for analyzing terrain			Recall procedures for driving M1 tank
Recall procedures for preparing sketch range card			

*Crewmen are encouraged to perform the many of the elements associated with PREFIRE Checks using the Technical Manual (TM).

ACTIVITY 3. ACQUIRE TARGETS

Part 3.1. Search for Targets

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 3.1.1. Search Open Hatch - Day</u>			
<u>Option 3.1.2. Search Closed Hatch - Day</u>			
Identify crew search sectors	Identify crew search sectors	Identify crew search sectors	Identify crew search sectors
Identify appropriate gun tube orientation	Identify appropriate settings for GNR station switches		Identify appropriate tank positions during movement
Demonstrate appropriate search techniques	Demonstrate appropriate search techniques	Demonstrate appropriate search techniques	Demonstrate appropriate search techniques

<u>Option 3.1.3. Search at Night</u>			
Identify crew search sectors	Identify crew search sectors	Identify crew search sectors	Identify crew search sectors
Identify appropriate gun tube orientation	Identify appropriate settings for GNR station switches		Identify appropriate tank positions during movement
Demonstrate appropriate search techniques (night)	Demonstrate appropriate search techniques (night)	Demonstrate appropriate search techniques (night)	Demonstrate appropriate search techniques (night)
		Recall function and operation of VV-2	Recall function and operation of VV-2

Part 3.2. Detect/Locate/Identify Target(s)

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
Identify target signatures	Identify target signatures	Identify target signatures	Identify target signatures
Recall methods of reporting target location	Recall methods of reporting target location	Recall methods of reporting target location	Recall methods of reporting target location
Identify targets as friend/foe/neutral and by nomenclature	Identify targets as friend/foe/neutral and by nomenclature	Identify targets as friend/foe/neutral and by nomenclature	Identify targets as friend/foe/neutral and by nomenclature
Classify targets by threat			
Recall appropriate procedure for estimating range to target	Recall appropriate procedure for estimating range to target		
Recall elements of appropriate verbal report	Recall elements of appropriate verbal report	Recall elements of appropriate verbal report	Recall elements of appropriate verbal report
			Identify sources of cover and concealment

Part 3.3. Evaluate Situation

Identify appropriate weapon, ammo, and firing mode

Recall elements of appropriate fire command

ACTIVITY 4. ENGAGE SINGLE TARGET USING PRECISION GUNNERY

TC	GNR	LDR	DVR
<u>Option 4.1. Engage Single Target from the Offensive Using Precision Gunnery</u>			
<u>Option 4.2. Engage Single Target from the Defensive Using Precision Gunnery</u>			
Recall elements of appropriate verbal report			Recall procedures for driving M1 tank
Recall elements of appropriate fire command	Identify appropriate settings for GNR station switches	Identify announced ammo	
Recall function and operation of TC control handles	Recall procedures for determining turret/hull defilade	Recall function of GUN/TURRET DRIVE switch	
Recall appropriate verbal command to guide GNR	Recall function and operation of GNR control handles	Recall function and operation of ejection guard	
Recall elements of appropriate verbal commands to guide DVR	Identify appropriate aiming point on reticle	Recall procedures for loading main gun round	
	Recall operation and function of laser buttons	Recall procedures for unloading/storing main gun round	
	Recall appropriate procedure for estimating range to target	Recall elements of appropriate verbal commands/announcement	
	Interpret meaning of LRF symbols/readout		
	Recall elements of appropriate verbal command/announcement		

ACTIVITY 5. ADJUST FIRE

TC	GNR	LDR	DVR
	Recall function and operation of GNR control handles	Recall function of GUN/TURRET DRIVE switch	
	Identify adjusted aiming point on reticle	Recall procedures for loading main gun round	
		Recall function and operation of ejection guard	
		Recall elements of appropriate verbal command/announcement	

Option 5.1. Use Reengage Technique

Recall appropriate procedure for estimating range to target	Recall elements of appropriate verbal command/announcement
Recall elements of appropriate fire command	Recall function and operation of GNR control handles
	Identify aiming point on reticle
	Recall function and operation of laser buttons
	Interpret LRF symbols/readout

Option 5.2. Use Standard Adjustment

Recall elements of appropriate verbal command/announcement

Recall function and operation of GNR control handles

Recall gunner's standard adjustments

Identify aiming point on reticle

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 5.3. Use TC adjustment</u>			
Recall TCs standard adjustments			
Recall elements of appropriate fire command	Recall function and operation of GNR control handles		
	Identify aiming point on reticle		
	Recall elements of appropriate verbal command/announcement		
Recall elements of verbal commands to guide DVR			Identify primary, alternate, and supplementary positions
			Recall procedures to drive M1 tank

ACTIVITY 6. ENGAGE TARGETS WITH THE COAX

TC	GNR	LDR	DVR
Recall elements of appropriate fire command	Identify appropriate settings for GNR station switches	Recall function of GUN/TURRET DRIVE switch	Recall procedures for driving M1 tank
Recall appropriate procedure for estimating range to target	Recall function and operation of GNR control handles		
Recall function and operation of TC control handles	Identify aiming point on reticle		
Recall elements of appropriate verbal command to guide GNR	Recall function and operation of laser buttons		
	Recall appropriate procedure for estimating range to target		
	Interpret meaning of LRF symbols/readout		
	Recall elements of appropriate verbal command/announcement		

ACTIVITY 7. ENGAGE MULTIPLE TARGETS

TC	GNR	LDR	DVR
Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5

ACTIVITY 8. ENGAGE TARGETS WITH THE CAL .50

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 8.1. Simultaneous Targets</u>			
Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5	Knowledges associated with Activities 4 and 5.

Option 8.2. Cal .50 Targets

Recall function and
operation of CWS
controls to traverse
elevate, and fire
Cal .50

Recall appropriate
procedure for
estimating range to
target

Identify aiming
point on Cal .50
reticle

Recall elements of
appropriate verbal
command/
announcement

ACTIVITY 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES

TC	GNR	LDR	DVR
<u>Option 9.1. Engage Target Using Battlesight Gunnery</u>			
Recall elements of appropriate fire command	Identify appropriate settings for GNR station switches	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall appropriate procedure for estimating range to target	Knowledges associated with Activity 4		
Recall function and operation of manual range controls			
Interpret LRF symbols/readout			
Knowledges associated with Activity 4			

<u>Option 9.2. Engage Target Given Effective LRF</u>			
<u>Case 9.2.A. Use Battlesight Gunnery</u>			
Knowledges associated with Option 9.1.			

<u>Case 9.2.B. TC Indexes Range</u>			
Recall elements of appropriate fire command	Knowledges associated with Activity 4	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall appropriate procedure for estimating range to target			
Recall function and operation of manual range controls			

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Case 9.2.C. Gunner</u> <u>Indexes Range</u>			
Knowledges associated with Activity 4	Recall appropriate procedure for estimating range to target Recall procedures for retrieving/ storing data in ballistic computer Knowledges associated with Activity 4, with the exception of lase buttons		

Case 9.2.D. Gunner
Manually Applies
Range

Knowledges
associated with
Option 9.10

Option 9.3. Engage Target Given Multiple Returns from LRF

Recall appropriate procedure for estimating range to target	Recall function and operation of lase buttons	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Interpret meaning of LRF symbols/readout	Interpret meaning of LRF symbols/readout		
Recall elements of appropriate verbal command/ announcement	Recall elements of appropriate verbal command/ announcement Identify appropriate settings for GNR station switches		

Case 9.3.A. Gunner Relases

Recall elements of appropriate verbal command/ to guide GNR	Recall operation and function of lase buttons Knowledges associated with Activity 4	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Knowledges associated with Activity 4			

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>TVR</u>
<u>Case 9.3.B. TC Corrects Range</u>			
Recall function and operation of manual range controls	Knowledges associated with Activity 4	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall appropriate procedure for estimating range to target			

<u>Option 9.4. Engage Target Given No Range Display (Loss of Symbology)</u>			
<u>Case 9.4.A. Little or No Time</u>			
Knowledges associated with Activity 4, with the exception of estimating range			

<u>Case 9.4.B. Time Permitting</u>			
Recall elements of appropriate verbal command to guide GNR	Recall procedures for retrieving/storing data in ballistic computer	Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall appropriate procedure for estimating range to target	Knowledges associated with Activity 4		
Knowledges associated with Activity 4			

<u>Option 9.5. Engage Target Given Crosswind Sensor Failure</u>			
Knowledges associated with Option 9.1	Recall procedures for conducting computer self-test	Knowledges associated with Option 9.1	Knowledges associated with Option 9.1
	Interpret output from computer self-test		
	Recall procedures for retrieving/storing data in ballistic computer		
	Knowledges associated with Option 9.1		

TC	GNR	LDR	DVR
<u>Option 9.6. Engage Target Given Cant Sensor Failure</u>			
Recall elements of appropriate verbal command to guide DVR	Recall procedures for conducting computer self-test	Knowledges associated with Activity 4	Recall procedures for driving M1 tank
Knowledges associated with Activity 4	Interpret output from computer self-test		Knowledges associated with Activity 4
	Recall procedures for retrieving/storing data in ballistic computer		
	Determine appropriate compensation for cant		
	Knowledges associated with Activity 4.		

Option 9.7. Engage Target Given Lead Angle Sensor Failure

Recall elements of appropriate verbal command to guide DVR	Recall procedures for conducting computer self-test	Knowledges associated with Activity 4	Recall procedures for driving M1 tank
Knowledges associated with Activity 4	Interpret output from computer self-test		Knowledges associated with Activity 4
	Recall procedures for retrieving/storing data in ballistic computer		
	Identify appropriate reticle aiming point to manually lead target		
	Knowledges associated with Activity 4		

Option 9.8. Engage Target Given GPS Failure (Day Channel)

Knowledges associated with Activity 4	Knowledges associated with Activity 4	Knowledges associated with Activity 4	Knowledges associated with Activity 4
---------------------------------------	---------------------------------------	---------------------------------------	---------------------------------------

<u>TC</u>	<u>GNR</u>	<u>LC</u>	<u>DVR</u>
<u>Option 9.9. Engage Target Given GPS/TIS Failure</u>			
<u>Case 9.9.A. Use GAS with Precision Techniques</u>			
Knowledges associated with Option 9.10	Knowledges associated with Option 9.10	Knowledges associated with Activity 4	Knowledges associated with Activity 4

<u>Case 9.9.B. Use GAS with Battlesight Techniques</u>			
Knowledges associated with Option 9.1	Knowledges associated with Option 9.1, but using the GAS instead of the GPS	Knowledges associated with Activity 4	Knowledges associated with Activity 4

<u>Option 9.10. Engage Target Using GAS</u>			
Recall appropriate procedure for estimating range to target		Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall function and operation of TC control handles			
Recall appropriate fire command	Recall appropriate settings for GNR station switches		
Recall elements of appropriate verbal command to guide GNR	Recall function and operation of GNR control handles		
	Indicate appropriate aiming point on reticle to manually lead target		
	Recall elements of appropriate verbal command/announcement		

TC	GNR	LDR	DVR
<u>Option 9.11. Engage Target Given Stabilization System Failure (Emergency Mode)</u>			
Recall elements of appropriate fire command	Identify appropriate settings for GNR station switches.	Knowledges associated with Activity	Knowledges associated with Activity 4
Recall elements of appropriate verbal command to guide DVR	Recall function and operation of GNR control handles.		
Recall function and operation of TC controls	Indicate appropriate aiming point on reticle and to manually lead target.		
Recall elements of appropriate verbal command to guide GNR	Recall elements of appropriate verbal command/announcement		

Option 9.12. Engage Target in Manual Mode

Recall appropriate procedure for estimating range to target		Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall elements of appropriate fire command	Identify appropriate settings for GNR station switches		
Recall elements of appropriate verbal commands to guide DVR	Recall function and operation of manual traverse/elevation controls		
	Indicate appropriate aiming point on reticle to manually apply lead		
	Recall elements of appropriate verbal command/announcement		

ACTIVITY 10. ENGAGE TARGET FROM TC POSITION

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Case 10.A. Gunner Cannot Identify Target</u>			
Recall elements of appropriate fire command	Identify appropriate setting for GNR station switches	Knowledges associated with Activity 4	Knowledges associated with Activity 4

Case 10.B. Three-Man Crew

Recall elements of appropriate verbal command/announcement		Knowledges associated with Activity 4	Knowledges associated with Activity 4
Recall function and operation of TC control handles			
Recall function and operation of laser buttons			
Recall appropriate procedure for estimating range to target			
Identify aiming point on reticle			

ACTIVITY 11. ASSESS RESULTS OF ENGAGEMENT

TC	GNR	LDR	DVR
Recall appropriate reassignment of tank crew duties	Recall function and operation of MRS	Identify appropriate fluid level in replenisher reservoir	
Recall elements of SPOTREP			
<hr/>			
<u>Option 11.A. Stationary</u>			
Recall elements of appropriate verbal commands to guide DVR			Recall procedures for driving M1 tank
<hr/>			
<u>Option 11.B. Moving</u>			
Identify appropriate battlecarry ammo and battlesight range	Recall appropriate position of GNR station switches	Knowledges associated with Activity 4	Recall procedures for driving M1 tank
Recall elements of appropriate commands to guide DVR	Recall elements of appropriate verbal command/announcement		
<hr/>			

ACTIVITY 12. ENGAGE TARGETS WITH LOADER'S M240 MACHINEGUN

TC

Recall elements of
appropriate fire
command

GNR

LDR

Recall operation of
M240 MG

DVR

ACTIVITY 13. IMMEDIATE ACTION-MISFIRE

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
Recall function and operation of TC control handles	Recall function and operation of manual firing controls	Recall procedures for unloading main gun Recall procedures to perform manual extraction of main gun round	

ACTIVITY 14. EMPLOY SMOKE

<u>TC</u>	<u>GNR</u>	<u>LDR</u>	<u>DVR</u>
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>			
Recall elements of appropriate verbal command/announcement	Recall function and operation of GNR control handles		
Recall function and operation of TC control handles			
Identify appropriate pattern of fire for smoke grenades			
Recall operation of M250 grenade launcher			

<u>Option 14.2. Use Vehicle Engine Exhaust System</u>			
Recall elements of appropriate verbal command/announcement			Recall function and operation of SMOKE GENERATOR switch
Recall elements of appropriate verbal commands to guide DVR			

ACTIVITY 15. SUBMIT REPORTS

TC

GNR

LDR

DVR

Recall elements of
appropriate verbal
report

Appendix D

Analysis of M1 Gunnery-Related Tank Components

Device: TopGun

Component	Subcomponent	Present? (Yes/No)	Comments
1. Weapons	a. main gun	<u>Yes</u>	<u> </u>
	b. commander's machinegun	<u>No</u>	<u> </u>
	c. coax	<u>No</u>	<u> </u>
	d. loaders machinegun	<u>No</u>	<u> </u>
	e. grenade launcher	<u>No</u>	<u> </u>
2. Sights	a. CWS unity periscopes	<u>No</u>	<u> </u>
	b. CWS sight	<u>No</u>	<u> </u>
	c. GPSE	<u>No</u>	<u> </u>
	d. GPS	<u>Yes</u>	<u> </u>
	e. GAS	<u>Yes</u>	<u> </u>
	f. TIS	<u>Yes</u>	<u> </u>
	g. Loader's periscope	<u>No</u>	<u> </u>
	h. Driver's periscopes	<u>No</u>	<u> </u>
	i. Night vision viewer	<u>No</u>	<u> </u>
Fire system controls:			
3. Commander's Station	a. CWS control handle (cupola)	<u>No</u>	<u> </u>
	b. Cmdr's cntrl handle (turret)	<u>No</u>	<u> </u>
	c. commander's control panel	<u>No</u>	<u> </u>
	d. cupola man. trav./elev. cntrl	<u>No</u>	<u> </u>

Component	Subcomponent	Present? (Yes/No)	Comments
4. Gunner's Station	a. control handles	Yes	
	b. ballistic comp cntrl panel	No	
	c. GAS control panel	No	
	d. intercom controls	No	
	e. manual trav./elev. controls	No	
			Located to left of "sight" rather than below it.
	f. reticle control panel	Yes	NORMAL MODE DRIFT knobs, FLTR/CLEAR/SHTR switch, and AMMO SELECT switch painted on.
	g. fire control panel	Yes	Painted on--not functional.
			POLARITY and STANDBY switches are functional, remainder of controls are painted on.
	h. thermal imaging control panel	Yes	
5. Loader's Station	i. LRF control panel	No	
	j. MRS lever	No	
	a. Loader's control panel	No	
	b. intercom controls	No	
	c. turret traverse lock	No	
	d. main gun breechblock	No	
6. Driver's Station	e. ammo doors and racks	No	
	f. knee switch	No	
	a. DVR's master panel	No	
	b. DVR's instrument panel	No	
	c. DVR's alert panel	No	
	d. steer-throttle controls	No	
	e. brake pedals	No	

Component	Subcomponent	Present? (Yes/No)	Comments
1. Weapons	a. main gun	Yes	
	b. commander's machinegun	No	
	c. coax	Yes	
	d. loaders machinegun	No	
	e. grenade launcher	No	
2. Sights	a. CWS unity periscopes	No	
	b. CWS sight	No	
	c. GPSE	No	
	d. GPS	Yes	
	e. GAS	No	
	f. TIS	Yes	
	g. Loader's periscope	No	
	h. Driver's periscopes	No	
	i. Night vision viewer	No	
Fire system controls:			
3. Commander's Station	a. CWS control handle (cupola)	No	
	b. Cmdr's cntrl handle (turret)	No	
	c. commander's control panel	No	
	d. cupola man. trav./elev. cntrl	No	

Component	Subcomponent	Present? (Yes/No)	Comments
4. Gunner's Station	a. control handles	Yes	
	b. ballistic comp cntrl panel	No	
	c. GAS control panel	Yes	RETICLE SELECT switch represented others are not.
	d. intercom controls	No	
	e. manual trav./elev. controls	No	
			Normal MODE DRIFT knobs not functional.
	f. reticle control panel	Yes	Magnification lever painted on in 10X position.
	g. fire control panel	No	
			TRU READY light, SYMBOLS dial, FAULT light and BORESIGHT knobs not represented.
			CONTRAST dial does not work. UNIT TEST PATTERN switch does not work.
	h. thermal imaging control panel	Yes	
	i. LRF control panel	No	
	j. MRS lever	No	
5. Loader's Station	a. Loader's control panel	No	
	b. intercom controls	No	
	c. turret traverse lock	No	
	d. main gun breechblock	No	
	e. ammo doors and racks	No	
	f. knee switch	No	
6. Driver's Station	a. DVR's master panel	No	
	b. DVR's instrument panel	No	
	c. DVR's alert panel	No	
	d. steer-throttle controls	No	
	e. brake pedals	No	

Component	Subcomponent	Present? (Yes/No)	Comments
1. Weapons	a. main gun	<u>Yes</u>	<u></u>
	b. commander's machinegun	<u>Yes</u>	<u></u>
	c. coax	<u>Yes</u>	<u></u>
	d. loaders machinegun	<u>No</u>	<u></u>
	e. grenade launcher	<u>Yes</u>	<u></u>
2. Sights	a. CWS unity periscopes	<u>Yes</u>	<u>Frontal only.</u>
	b. CWS sight	<u>Yes</u>	<u></u>
	c. GPSE	<u>Yes</u>	<u></u>
	d. GPS	<u>Yes</u>	<u></u>
	e. GAS	<u>Yes</u>	<u></u>
	f. TIS	<u>Yes</u>	<u></u>
	g. Loader's periscope	<u>No</u>	<u></u>
	h. Driver's periscopes	<u>No</u>	<u></u>
	i. Night vision viewer	<u>No</u>	<u></u>
Fire system controls:			
3. Commander's Station	a. CWS control handle (cupola)	<u>Yes</u>	<u></u>
	b. Cmdr's cntrl handle (turret)	<u>Yes</u>	<u></u>
	c. commander's control panel	<u>Yes</u>	<u></u>
	d. cupola man. trav./elev. cntrl	<u>Yes</u>	<u></u>

Component	Subcomponent	Present? (Yes/No)	Comments
4. Gunner's Station	a. control handles	<u>Yes</u>	<u></u>
	b. ballistic comp cntrl panel	<u>Yes</u>	<u></u>
	c. GAS control panel	<u>Yes</u>	<u></u>
	d. intercom controls	<u>Yes</u>	<u></u>
	e. manual trav./elev. controls	<u>Yes</u>	<u></u>
	f. reticle control panel	<u>Yes</u>	<u></u>
	g. fire control panel	<u>Yes</u>	<u></u>
	h. thermal imaging control panel	<u>Yes</u>	<u></u>
	i. LRF control panel	<u>Yes</u>	<u></u>
	j. MRS lever	<u>Yes</u>	<u></u>
5. Loader's Station	a. Loader's control panel	<u>No</u>	<u></u>
	b. intercom controls	<u>No</u>	<u></u>
	c. turret traverse lock	<u>No</u>	<u></u>
	d. main gun breechblock	<u>No</u>	<u></u>
	e. ammo doors and racks	<u>No</u>	<u></u>
	f. knee switch	<u>No</u>	<u></u>
6. Driver's Station	a. DVR's master panel	<u>No</u>	<u></u>
	b. DVR's instrument panel	<u>No</u>	<u></u>
	c. DVR's alert panel	<u>No</u>	<u></u>
	d. steer-throttle controls	<u>No</u>	<u></u>
	e. brake pedals	<u>No</u>	<u></u>

Component	Subcomponent	Present? (Yes/No)	Comments
1. Weapons	a. main gun	Yes	
	b. commander's machinegun	No	
	c. coax	Yes	
	d. loaders machinegun	No	
	e. grenade launcher	No	
2. Sights	a. CWS unity periscopes	Yes	Forward unity periscope only.
	b. CWS sight	No	
	c. GPSE	Yes	
	d. GPS	Yes	
	e. GAS	Yes	
	f. TIS	Yes	
	g. Loader's periscope	No	
	h. Driver's periscopes	Yes	Center vision block only.
	i. Night vision viewer	No	
Fire system controls:			
3. Commander's Station	a. CWS control handle (cupola)	Yes	
	b. Cmdr's cntrl handle (turret)	Yes	
	c. commander's control panel	Yes	Only MANUAL RANGE BATTLES switch ADD-DROP switch and FIRE ControlMALF indicator light are operational.
	d. cupola man. trav./elev. cntrl	No	

Component	Subcomponent	Present? (Yes/No)	Comments
4. Gunner's Station	a. control handles	<u>Yes</u>	
	b. ballistic comp cntrl panel	<u>No</u>	
	c. GAS control panel	<u>Yes</u>	
	d. intercom controls	<u>Yes</u>	
	e. manual trav./elev. controls	<u>No</u>	
	f. reticle control panel	<u>Yes</u>	All controls, except NORMAL MODE DRIFT knobs, are functional.
	g. fire control panel	<u>Yes</u>	NORMAL and EMERGENCY positions only.
	h. thermal imaging control panel	<u>Yes</u>	Only POLARITY switch is operational.
	i. LRF control panel	<u>Yes</u>	
	j. MRS lever	<u>No</u>	Not operational.
5. Loader's Station	a. Loader's control panel	<u>Yes</u>	TURRET BLOWER, are operational.
	b. intercom controls	<u>Yes</u>	
	c. turret traverse lock	<u>No</u>	Must remain locked.
	d. main gun breechblock	<u>No</u>	Not operational.
	e. ammo doors and racks	<u>No</u>	Not operational.
	f. knee switch	<u>Yes</u>	Activates sound of ammo door opening and permits ammo selection.
6. Driver's Station	a. DVR's master panel	<u>No</u>	Not operational.
	b. DVR's instrument panel	<u>No</u>	Speedometer is represented by a digital readout of speed in driver's monitor.
	c. DVR's alert panel	<u>No</u>	Not operational.
	d. steer-throttle controls	<u>Yes</u>	
	e. brake pedals	<u>Yes</u>	Service brake only, parking brake does not work.

Component	Subcomponent	Present? (Yes/No)	Comments
1. Weapons	a. main gun	<u>Yes</u>	
	b. commander's machinegun	<u>No</u>	
	c. coax	<u>No</u>	
	d. loaders machinegun	<u>No</u>	
	e. grenade launcher	<u>No</u>	
2. Sights	a. CWS unity periscopes	<u>Yes</u>	
	b. CWS sight	<u>No</u>	
	c. GPSE	<u>Yes</u>	
	d. GPS	<u>Yes</u>	
	e. GAS	<u>No</u>	
	f. TIS	<u>No</u>	
	g. Loader's periscope	<u>Yes</u>	
	h. Driver's periscopes	<u>Yes</u>	
	i. Night vision viewer	<u>No</u>	
Fire system controls:			
3. Commander's Station	a. CWS control handle (cupola)	<u>Yes</u>	
	b. Cmdr's cntrl handle (turret)	<u>Yes</u>	
	c. commander's control panel	<u>Yes</u>	Warning lights, AUX HYDR POWER, and GRENADES controls are painted on. Remainder of controls are functional.
	d. cupola man. trav./elev. cntrl	<u>No</u>	

Component	Subcomponent	Present? (Yes/No)	Comments
4. Gunner's Station	a. control handles	<u>Yes</u>	
	b. ballistic comp cntrl panel	<u>No</u>	
	c. GAS control panel	<u>No</u>	
	d. intercom controls	<u>Yes</u>	
	e. manual trav./elev. controls	<u>No</u>	
			Magnification lever, AMMUNITION SELECT switch and GUN SELECT switch are functional. Remainder of controls are painted on.
	f. reticle control panel	<u>Yes</u>	
	g. fire control panel	<u>Yes</u>	FIRE CONTROL MODE switch is functional.
	h. thermal imaging control panel	<u>No</u>	All TIS controls are painted on.
	i. LRF control panel	<u>Yes</u>	RANGE switch is functional.
5. Loader's Station	j. MRS lever	<u>No</u>	
			TURRET BLOWER switch is painted on. Other controls are functional.
	a. Loader's control panel	<u>Yes</u>	
	b. intercom controls	<u>Yes</u>	Amplifier is painted on compartment door. Most radio controls painted on.
	c. turret traverse lock	<u>No</u>	
			Breechblock is simulated, does not open. Toggle switch used to represent opening/closing breechblock. Toggle switch used to represent ejector guard. Button used to represent loading/ unloading round.
	d. main gun breechblock	<u>Yes</u>	
			Ready rack is simulated. Indicator lamps show if ammo is available and whether it is HEAT or SABOT.
	e. ammo doors and racks	<u>Yes</u>	
	f. knee switch	<u>Yes</u>	

Component	Subcomponent	Present? (Yes/No)	Comments
6. Driver's Station			PANEL LIGHTS test button, VEHICLE MASTER POWER switch and indicator light, PUSH TO START button and indicator lights, TACTICAL IDLE switch, and SHUT OFF switch are functional. Remainder of controls are painted on.
	a. DVR's master panel	<u>Yes</u>	CABLE DISCONNECTED and CIRCUIT BREAKER OPEN indicator lights, and FIRE EXTINGUISHER 2nd SHOT switch are painted on. Remainder of controls are functional.
	b. DVR's instrument panel	<u>Yes</u>	
	c. DVR's alert panel etc.)	<u>Yes</u>	
	d. steer-throttle controls	<u>Yes</u>	
	e. brake pedals	<u>Yes</u>	

Appendix E

Analysis of M1 Tactical Gunnery Conditions

Device: TopGun

Parameters	Conditions	Present? (Yes/No)	Comments
1. Target Type	a. tank	Yes	
	b. pers. carrier	No	
	c. helicopter	No	
	d. bunkers	No	
	e. antitank	No	
	f. truck	No	
	g. troops	No	
	h. aircraft	No	
2. Target Movement	a. sta. front	Yes	
	b. sta. flank	Yes	
	c. sta. oblique	Yes	
	d. mov. flank	Yes	
	e. mov. oblique	Yes	
	f. mov. zig-zag	Yes	
	g. mov. approach	Yes	
	h. mov. retreating	Yes	
3. Target Cover/ Concealment	a. fully exposed	Yes	
	b. hull defilade	Yes	
	c. turret defilade	Yes	
	d. fully hidden	Yes	
4. Target Array	a. single targets	Yes	
	b. mult. targets	Yes	
	c. both sgl & mult	Yes	
5. Target Orientation	a. owntank	Yes	
	b. elsewhere	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
6. Target Range	a. < 900 meters	No	
	b. 900-1800 meters	Yes	
	c. > 1800 meters	Yes	
7. Target Sector	a. forward	Yes	
	b. flanks	No	
	c. rear	No	
8. IFFN	a. all threat	Yes	
	b. all friendly	No	
	c. mix	No	
9. Enemy Activity	a. no contact	No	
	b. direct fire	Yes	
	c. indirect fire	No	
	d. obstacles	No	
	e. minefields	No	
	f. elec c-meas	No	
10. NBC Conditions	a. free of hazards	Yes	
	b. contaminated	No	

Parameters	Conditions	Present? (Yes/No)	Comments
11. Equipment Status	a. fully oper'l	Yes	
	b. ineffective LRF	Yes	Simulates LRF overheating
	c. mult rtns	Yes	
	d. no symbols	No	
	e. crswnd snr fail	No	
	f. cant snr fail	No	
	g. lead snr fail	No	
	h. GPS fail	Yes	Simulates computer failure and automatically gives player GAS reticle.
	i. GPS/TIS fail	Yes	Simulates computer failure and automatically gives player GAS reticle.
	j. stab fail	No	
	k. turret pwr fail	No	
12. Number of Crewmen	a. four	Yes	
	b. three	No	
13. Supply Shortages	a. none	No	
	b. ammo	Yes	
	c. fuel	No	
14. Mission	a. offense (moving)	No	
	b. defense (st'ry)	Yes	
15. Fire Control	a. single tank	Yes	
	b. frontal (sc'n)	No	
	c. cross (sc'n)	No	
	d. depth (sc'n)	No	
	e. frontal (pltn)	No	
	f. cross (pltn)	No	
	g. depth (sc'n)	No	

Parameters	Conditions	Present? (Yes/No)	Comments
16. Movement Formation	a. column	No	
	b. echelon lft/rt	No	
	c. stgr'd column	No	
	d. line	No	
	e. wedge	No	
	f. herringbone	No	
	g. vee	No	
	h. coil	No	
17. Special Engagement Requirements	a. surprise tgts	No	
	b. assault fire	No	
	c. support by fire	No	
18. Space	a. spt-by-fire int	No	
	b. fire & man int	No	
	c. assault int	No	
	d. fire pos int	No	
19. Visibility	a. unlimited-day	Yes	
	b. limited-day	Yes	
	c. w/o ill-nite	Yes	
	d. w/ill-nite	No	
20. Terrain Grade	a. flat	No	
	b. hilly	Yes	
21. Terrain Vegetation	a. none	No	
	b. brush	No	
	c. trees	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
1. Target Type	a. tank	Yes	
	b. pers. carrier	Yes	
	c. helicopter	Yes	
	d. bunkers	No	
	e. antitank	No	
	f. truck	Yes	
	g. troops	Yes	
	h. aircraft	No	
2. Target Movement	a. sta. front	Yes	
	b. sta. flank	Yes	
	c. sta. oblique	Yes	
	d. mov. flank	Yes	
	e. mov. oblique	Yes	
	f. mov. zig-zag	Yes	
	g. mov. approach	Yes	
	h. mov. retreating	No	
3. Target Cover/ Concealment	a. fully exposed	Yes	
	b. hull defilade	No	
	c. turret defilade	No	
	d. fully hidden	No	
4. Target Array	a. single targets	Yes	
	b. mult. targets	Yes	
	c. both sgl & mult	No	
5. Target Orientation	a. owntank	Yes	
	b. elsewhere	Yes	
6. Target Range	a. < 900 meters	Yes	
	b. 900-1800 meters	Yes	
	c. > 1800 meters	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
7. Target Sector	a. forward	Yes	
	b. flanks	No	
	c. rear	No	
8. IFFN	a. all threat	Yes	
	b. all friendly	No	
	c. mix	No	
9. Enemy Activity	a. no contact	No	
	b. direct fire	No	
	c. indirect fire	No	
	d. obstacles	No	
	e. minefields	No	
	f. elec c-meas	No	
10. NBC Conditions	a. free of hazards	Yes	
	b. contaminated	No	Could be run with protective mask.
11. Equipment Status	a. fully oper'l	Yes	
	b. ineffective LRF	No	
	c. mult rtms	Yes	
	d. no symbols	No	
	e. crswnd snr fail	No	
	f. cant snr fail	No	
	g. lead snr fail	No	
	h. GPS fail	No	
	i. GPS/TIS fail	No	
	j. stab fail	No	
	k. turret pwr fail	No	
12. Number of Crewmen	a. four	Yes	
	b. three	No	

Parameters	Conditions	Present? (Yes/No)	Comments
13. Supply Shortages	a. none	No	
	b. ammo	Yes	
	c. fuel	No	
14. Mission	a. offense (moving)	Yes	
	b. defense (st'ry)	Yes	
15. Fire Control	a. single tank	Yes	
	b. frontal (sc'n)	No	
	c. cross (sc'n)	No	
	d. depth (sc'n)	No	
	e. frontal (pltn)	No	
	f. cross (pltn)	No	
	g. depth (sc'n)	No	
16. Movement Formation	a. column	No	
	b. echelon lft/rt	No	
	c. stgr'd column	No	
	d. line	No	
	e. wedge	No	
	f. herringbone	No	
	g. vee	No	
	h. coil	No	
17. Special Engagement Requirements	a. surprise tgts	No	
	b. assault fire	No	
	c. support by fire	No	
18. Space	a. spt-by-fire int	No	
	b. fire & man int	No	
	c. assault int	No	
	d. fire pos int	No	

Parameters	Conditions	Present? (Yes/No)	Comments
19. Visibility	a. unlimited-day	<u>Yes</u>	<u> </u>
	b. limited-day	<u>Yes</u>	<u> </u>
	c. w/o ill-nite	<u>Yes</u>	<u> </u>
	d. w/ill-nite	<u>No</u>	<u> </u>
20. Terrain Grade	a. flat	<u>Yes</u>	<u> </u>
	b. hilly	<u>Yes</u>	<u> </u>
21. Terrain Vegetation	a. none	<u>No</u>	<u> </u>
	b. brush	<u>Yes</u>	<u> </u>
	c. trees	<u>Yes</u>	<u> </u>

Parameters	Conditions	Present? (Yes/No)	Comments
1. Target Type	a. tank	<u>Yes</u>	<u> </u>
	b. pers. carrier	<u>Yes</u>	<u> </u>
	c. helicopter	<u>Yes</u>	<u> </u>
	d. bunkers	<u>No</u>	<u> </u>
	e. antitank	<u>No</u>	<u> </u>
	f. truck	<u>Yes</u>	<u> </u>
	g. troops	<u>Yes</u>	<u> </u>
	h. aircraft	<u>No</u>	<u> </u>
2. Target Movement	a. sta. front	<u>Yes</u>	<u> </u>
	b. sta. flank	<u>Yes</u>	<u> </u>
	c. sta. oblique	<u>Yes</u>	<u> </u>
	d. mov. flank	<u>Yes</u>	<u> </u>
	e. mov. oblique	<u>Yes</u>	<u> </u>
	f. mov. zig-zag	<u>Yes</u>	<u> </u>
	g. mov. approach	<u>Yes</u>	<u> </u>
	h. mov. retreating	<u>Yes</u>	<u> </u>
3. Target Cover/ Concealment	a. fully exposed	<u>Yes</u>	<u> </u>
	b. hull defilade	<u>Yes</u>	<u> </u>
	c. turret defilade	<u>Yes</u>	<u> </u>
	d. fully hidden	<u>Yes</u>	<u> </u>
4. Target Array	a. single targets	<u>Yes</u>	<u> </u>
	b. mult. targets	<u>Yes</u>	<u> </u>
	c. both sgl & mult	<u>No</u>	<u> </u>
5. Target Orientation	a. owntank	<u>Yes</u>	<u> </u>
	b. elsewhere	<u>Yes</u>	<u> </u>
6. Target Range	a. < 900 meters	<u>Yes</u>	<u>Minimum of 390.</u>
	b. 900-1800 meters	<u>Yes</u>	<u> </u>
	c. > 1800 meters	<u>Yes</u>	<u>Maximum of 2970.</u>

Parameters	Conditions	Present? (Yes/No)	Comments
7. Target Sector	a. forward	Yes	
	b. flanks	No	
	c. rear	No	
8. IFFN	a. all threat	Yes	
	b. all friendly	Yes	
	c. mix	Yes	
9. Enemy Activity	a. no contact	Yes	
	b. direct fire	Yes	
	c. indirect fire	No	
	d. obstacles	No	
	e. minefields	No	
	f. elec c-meas	No	
10. NBC Conditions	a. free of hazards	Yes	
	b. contaminated	No	Could be run in MOPP-4.
11. Equipment Status	a. fully oper'l	Yes	
	b. ineffective LRF	Yes	
	c. mult rtns	Yes	
	d. no symbols	No	
	e. crswnd snr fail	No	
	f. cant snr fail	No	
	g. lead snr fail	No	
	h. GPS fail	No	
	i. GPS/TIS fail	Yes	
	j. stab fail	Yes	
	k. turret pwr fail	Yes	
12. Number of Crewmen	a. four	Yes	
	b. three	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
13. Supply Shortages	a. none	Yes	
	b. ammo	No	
	c. fuel	No	
14. Mission	a. offense (moving)	Yes	
	b. defense (st'ry)	Yes	
15. Fire Control	a. single tank	Yes	
	b. frontal (sc'n)	No	
	c. cross (sc'n)	No	
	d. depth (sc'n)	No	
	e. frontal (pltn)	No	
	f. cross (pltn)	No	
	g. depth (sc'n)	No	
16. Movement Formation	a. column	No	
	b. echelon lft/rt	No	
	c. stgr'd column	No	
	d. line	No	
	e. wedge	No	
	f. herringbone	No	
	g. vee	No	
	h. coil	No	
17. Special Engagement Requirements	a. surprise tgts	No	
	b. assault fire	No	
	c. support by fire	No	
18. Space	a. spt-by-fire int	No	
	b. fire & man int	No	
	c. assault int	No	
	d. fire pos int	No	

Device: M-COFT (continued)

Parameters	Conditions	Present? (Yes/No)	Comments
19. Visibility	a. unlimited-day	<u>Yes</u>	<u> </u>
	b. limited-day	<u>Yes</u>	<u> </u>
	c. w/o ill-nite	<u>Yes</u>	<u> </u>
	d. w/ill-nite	<u>No</u>	<u> </u>
20. Terrain Grade	a. flat	<u>Yes</u>	<u> </u>
	b. hilly	<u>Yes</u>	<u> </u>
21. Terrain Vegetation	a. none	<u>Yes</u>	<u> </u>
	b. brush	<u>Yes</u>	<u> </u>
	c. trees	<u>Yes</u>	<u> </u>

Parameters	Conditions	Present? (Yes/No)	Comments
1. Target Type	a. tank	<u>Yes</u>	
	b. pers. carrier	<u>Yes</u>	<u>BMP, BRDM, ZSU.</u>
	c. helicopter	<u>No</u>	
	d. bunkers	<u>No</u>	
	e. antitank	<u>No</u>	
	f. truck	<u>No</u>	
	g. troops	<u>Yes</u>	
	h. aircraft	<u>No</u>	
2. Target Movement	a. sta. front	<u>Yes</u>	
	b. sta. flank	<u>Yes</u>	
	c. sta. oblique	<u>Yes</u>	
	d. mov. flank	<u>Yes</u>	
	e. mov. oblique	<u>No</u>	
	f. mov. zig-zag	<u>No</u>	
	g. mov. approach	<u>Yes</u>	
	h. mov. retreating	<u>No</u>	
3. Target Cover/ Concealment	a. fully exposed	<u>Yes</u>	
	b. hull defilade	<u>Yes</u>	
	c. turret defilade	<u>Yes</u>	
	d. fully hidden	<u>Yes</u>	
4. Target Array	a. single targets	<u>Yes</u>	
	b. mult. targets	<u>Yes</u>	
	c. both sgl & mult	<u>Yes</u>	
5. Target Orientation	a. owntank	<u>Yes</u>	
	b. elsewhere	<u>Yes</u>	
6. Target Range	a. < 900 meters	<u>Yes</u>	<u>Minimum of 200 meters.</u>
	b. 900-1800 meters	<u>Yes</u>	
	c. > 1800 meters	<u>Yes</u>	<u>Maximum of 2200 meters.</u>

Parameters	Conditions	Present? (Yes/No)	Comments
7. Target Sector	a. forward	Yes	
	b. flanks	No	
	c. rear	No	
8. IFFN	a. all threat	Yes	
	b. all friendly	No	
	c. mix	No	
9. Enemy Activity	a. no contact	No	All contact.
	b. direct fire	Yes	
	c. indirect fire	No	
	d. obstacles	No	
	e. minefields	No	
	f. elec c-meas	No	
10. NBC Conditions	a. free of hazards	Yes	
	b. contaminated	No	Could be run in MOPP-4.
11. Equipment Status	a. fully oper'l	Yes	
	b. ineffective LRF	Yes	
	c. mult rtns	Yes	Does not appear to give false multiple returns.
	d. no symbols	Yes	
	e. crswnd snr fail	No	
	f. cant snr fail	No	
	g. lead snr fail	No	
	h. GPS fail	No	
	i. GPS/TIS fail	Yes	
	j. stab fail	Yes	
	k. turret pwr fail	No	
12. Number of Crewmen	a. four	Yes	
	b. three	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
13. Supply Shortages	a. none	Yes	
	b. ammo	No	
	c. fuel	No	
14. Mission	a. offense (moving)	Yes	
	b. defense (st'ry)	Yes	
15. Fire Control	a. single tank	Yes	
	b. frontal (sc'n)	No	
	c. cross (sc'n)	No	
	d. depth (sc'n)	No	
	e. frontal (pltn)	No	
	f. cross (pltn)	No	
	g. depth (sc'n)	No	
16. Movement Formation	a. column	No	
	b. echelon lft/rt	No	
	c. stgr'd column	No	
	d. line	No	
	e. wedge	No	
	f. herringbone	No	
	g. vee	No	
	h. coil	No	
17. Special Engagement Requirements	a. surprise tgts	No	
	b. assault fire	No	
	c. support by fire	No	
18. Space	a. spt-by-fire int	No	
	b. fire & man int	No	
	c. assault int	No	
	d. fire pos int	No	

Parameters	Conditions	Present? (Yes/No)	Comments
19. Visibility	a. unlimited-day	<u>Yes</u>	
	b. limited-day	<u>No</u>	
	c. w/o ill-nite	<u>Yes</u>	
	d. w/ill-nite	<u>No</u>	
20. Terrain Grade	a. flat	<u>Yes</u>	
	b. hilly	<u>Yes</u>	<u>Rolling hills.</u>
21. Terrain Vegetation	a. none	<u>Yes</u>	
	b. brush	<u>No</u>	
	c. trees	<u>Yes</u>	<u>Simulated by triangles.</u>

Parameters	Conditions	Present? (Yes/No)	Comments
1. Target Type	a. tank	Yes	Friendly and enemy.
	b. pers. carrier	Yes	
	c. helicopter	Yes	
	d. bunkers	No	
	e. antitank	No	
	f. truck	Yes	
	g. troops	No	
	h. aircraft	Yes	
2. Target Movement	a. sta. front	Yes	
	b. sta. flank	Yes	
	c. sta. oblique	Yes	
	d. mov. flank	Yes	
	e. mov. oblique	Yes	
	f. mov. zig-zag	Yes	
	g. mov. approach	Yes	
	h. mov. retreating	Yes	
3. Target Cover/ Concealment	a. fully exposed	Yes	
	b. hull defilade	Yes	
	c. turret defilade	Yes	
	d. fully hidden	Yes	
4. Target Array	a. single targets	Yes	
	b. mult. targets	Yes	
	c. both sgl & mult	Yes	
5. Target Orientation	a. owntank	Yes	
	b. elsewhere	Yes	
6. Target Range	a. < 900 meters	Yes	
	b. 900-1800 meters	Yes	
	c. > 1800 meters	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
7. Target Sector	a. forward	Yes	
	b. flanks	Yes	
	c. rear	Yes	
8. IFFN	a. all threat	Yes	
	b. all friendly	Yes	
	c. mix	Yes	
9. Enemy Activity	a. no contact	Yes	
	b. direct fire	Yes	
	c. indirect fire	Yes	
	d. obstacles	No	
	e. minefields	No	
	f. elec c-meas	No	
10. NBC Conditions	a. free of hazards	Yes	
	b. contaminated	No	Could be run in MOPP-4.
11. Equipment Status	a. fully oper'l	Yes	
	b. ineffective LRF	No	
	c. mult rtns	Yes	
	d. no symbols	No	
	e. crswnd snr fail	No	
	f. cant snr fail	No	
	g. lead snr fail	No	
	h. GPS fail	No	
	i. GPS/TIS fail	No	
	j. stab fail	No	
	k. turret pwr fail	No	
12. Number of Crewmen	a. four	Yes	
	b. three	Yes	

Parameters	Conditions	Present? (Yes/No)	Comments
13. Supply Shortages	a. none	Yes	
	b. ammo	Yes	
	c. fuel	Yes	
14. Mission	a. offense (moving)	Yes	
	b. defense (st'ry)	Yes	
15. Fire Control	a. single tank	Yes	
	b. frontal (sc'n)	Yes	
	c. cross (sc'n)	Yes	
	d. depth (sc'n)	Yes	
	e. frontal (pltn)	Yes	
	f. cross (pltn)	Yes	
	g. depth (sc'n)	Yes	
16. Movement Formation	a. column	Yes	
	b. echelon lft/rt	Yes	
	c. stgr'd column	Yes	
	d. line	Yes	
	e. wedge	Yes	
	f. herringbone	Yes	
	g. vee	Yes	
	h. coil	Yes	
17. Special Engagement Requirements	a. surprise tgts	Yes	
	b. assault fire	Yes	
	c. support by fire	Yes	
18. Space	a. spt-by-fire int	Yes	
	b. fire & man int	Yes	
	c. assault int	Yes	
	d. fire pos int	Yes	

Device: SIMNET (continued)

Parameters	Conditions	Present? (Yes/No)	Comments
19. Visibility	a. unlimited-day	<u>Yes</u>	<u> </u>
	b. limited-day	<u>No</u>	<u> </u>
	c. w/o ill-nite	<u>No</u>	<u> </u>
	d. w/ill-nite	<u>No</u>	<u> </u>
20. Terrain Grade	a. flat	<u>Yes</u>	<u> </u>
	b. hilly	<u>Yes</u>	<u> </u>
21. Terrain Vegetation	a. none	<u>Yes</u>	<u> </u>
	b. brush	<u>Yes</u>	<u> </u>
	c. trees	<u>Yes</u>	<u> </u>

Appendix F
Analysis of Crew-Level Behaviors

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Note. The ratings presented in this appendix are abbreviated as follows:
highly supported = H, partially supported = P, minimally supported = M, and
not supported = N.

ASSESSMENT OF GUNNER ACTIVITIES ON TOPGUN

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
Top Gun does not support gunner's preops. There is no time to conduct preops since the controls are only functional during the course of an exercise.		
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Top Gun does not support gunner's prefire checks. There is no time to conduct pre-fire checks since the controls work and an image is presented only during the course of an exercise.		
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search		
Top Gun does not support open-hatch viewing.		
<u>Option 3.1.2. Closed hatch - day</u>		
Select 3X GPS/TIS magnification	<u>P</u>	<u>GPS magnification lever is simulated by a 2-position switch.</u>
Search on gun axis using GPS	<u>P</u>	<u>Monocular sight is simulated by binocular display.</u>
		<u>Toggle switch used to select GPS/TIS/GAS.</u>
		<u>Can perform, but switching to thermal does not provide any extra information, only changes colors of computer generated image (CGI).</u>
Alternate using GPS with TIS	<u>M</u>	
Execute search techniques to acquire targets	<u>M</u>	<u>Can perform, but low quality CGI and Top-down wide field of view window (not on M1) make target detection easier.</u>
<u>Option 3.1.3. Night</u>		
Search on gun axis using TIS	<u>N</u>	<u>Top Gun does not simulate night engagements.</u>
Part 3.2. Detection/Location/Identify Target(s)		
Detect targets(s)/signature(s)/obstacles	<u>M</u>	<u>Can perform, but low quality CGI and Top-down wide field of view window (not on M1) make target detection easier.</u> <u>No smoke or dust, only target signature is gun flash.</u>
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		
• IFFN	<u>N</u>	<u>All targets are threats.</u>
• Nomenclature	<u>N</u>	<u>All targets are threat tanks (T-62).</u>
If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	<u>M</u>	<u>Can perform, although TC/crew not present.</u> <u>Traverse method supported; clock, sector, TRP, and grid methods are not.</u>
Confirm acquisition report	<u>N</u>	<u>No crewmen to provide acquisition report.</u>
Estimate range to evaluate LRF return	<u>M</u>	<u>Range cues provided by CGI are substantially different from real-world cues.</u>
Part 3.3. Evaluate Situation		
No gunner actions specified.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGET WITH THE MAIN GUN		
<u>Option 4.1. Precision engagement - moving (offense)</u>		
Top Gun does not simulate offensive engagements (owntank movement).		

<u>Option 4.2. Precision engagement - defense</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	N	FIRE CONTROL MODE switch is painted on.
• LRF: ARM LAST RTN	H	
• GPS: 3X	P	GPS magnification lever simulated by 2-position switch and located in different position than M1.
• GUN SELECT: MAIN	P	Switch is represented, does not work in coax. Indicator lights painted on.
• AMMO SELECT: as announced	N	AMMO SELECT switch is painted on. All engagements use SABOT.
Sight through GPS	P	Monocular sight is simulated by monitor which is viewed binocularly. Toggle switch used to select GPS/TIS/GAS.
Grasp palm switches	H	
Look through GAS to determine when gun clears defilade	N	Owntank is always in hull-down position w/no defilade blocking main gun. Toggle switch used to select GPS/TIS/GAS.
Announce DRIVER STOP	N	No driver station or simulated driver.
Look through GPS	P	Monocular sight is simulated by monitor which is viewed binocularly. Toggle switch used to select GPS/TIS/GAS.
Announce IDENTIFIED	P	Can perform, although remainder of crew is not present.
Switch GPS to 10X	P	GPS magnification lever simulated by 2-position switch and located in different position than M1.
Lay on center mass of target	H	
Track moving target	H	
Depress lase button(s)	H	
Evaluate range display	P	Range cues differ from real-world.
Check ready-to-fire and fault symbols	H	
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	P	Can perform, although remainder of crew is not present.
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGET WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Announce CANNOT IDENTIFY or does not respond	<u>N</u>	<u>Simulated TC voice will not respond to announcement.</u>
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
Announce IDENTIFY <DIFFERENT TARGET>	<u>N</u>	<u>Simulated TC voice does not identify incorrectly; will not respond to announcement.</u>

<u>Option 4.4. Use TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings:		
• THERMAL MODE: ON	<u>H</u>	
• FLTR/CLEAR/SHTR: SHTR	<u>N</u>	<u>FLTR/CLEAR/SHTR switch painted on, does not work.</u>
• THERMAL MAGNIFICATION: 3 TO 10X	<u>P</u>	<u>Rotary switch in M1 is simulated by 2-position toggle switch</u>
• POLARITY SWITCH: WHITE or BLACK HOT, as desired	<u>H</u>	
• SENSITIVITY/CONTRAST/FOCUS for best image	<u>N</u>	<u>SENSITIVITY, CONTRAST, and FOCUS knobs painted on, do not work.</u>

Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	<u>No recoil, therefore sight picture is not lost. No obscuration effects.</u>
Observe/announce strike of every round	<u>P</u>	<u>Can announce, although remainder of crew not present.</u>

<u>Option 5.1. Reengage</u>		
Announce REENGAGING	<u>P</u>	<u>Can announce, although remainder of crew not present.</u>
Release/reengage palm switches	<u>H</u>	
- - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		

<u>Option 5.2. Standard adjustment</u>		
Observe/announce deflection and range error	<u>P</u>	<u>Can announce, although remainder of crew not present.</u>
Release/reengage palm switches	<u>H</u>	
Adjust 1 mil deflection	<u>H</u>	
Adjust 1 mil (GPS)/ Adjust 200 meters range (GAS)	<u>H</u>	
- - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE (continued)		
<u>Option 5.3. TC adjustment</u>		
Top Gun does not provide a TC station nor simulate TC engagements.		
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Top Gun does not simulate coax engagements.		
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 5.</u>
If first target is not destroyed, adjust fire as described in Activity 5		<u>See comments listed under Activity 5.</u>
Engage second target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS MAIN GUN ENGAGEMENTS		
Top Gun does not provide TC station or simulate cal .50, therefore does not support simultaneous engagements.		
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Top Gun does not support battlesight gunnery. Simulated TC voice does not announce battlesight engagements. Battlesight range and ammo cannot be indexed.		
<u>Option 9.2. Engage target given ineffective LRF</u>		
<u>Case 9.2.A. Use battlesight gunnery</u>		
Top Gun does not support battlesight gunnery.		
<u>Case 9.2.B. TC indexes range</u>		
Top Gun does not support, TC cannot index range.		
<u>Case 9.2.C. GNR indexes range</u>		
Top Gun does not support, Gunner cannot index range; no CCP.		
<u>Case 9.2.D. GNR manually applies range</u>		
Engage target using GAS (Option 9.10)		<u>See ratings and comments associated with Option 9.10.</u>

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.3. Engage target given multiple returns from LRF</u>		
Depress lase button(s)	H	
If multiple return symbol appears in GPS, announce RANGE <IN METERS>	P	Can announce, although remainder of crew is not present.
Switch LRF setting in accordance with TC instructions	N	No TC to announce instructions. Simulated TC provides only fire commands.
<u>Case 9.3.A. Gunner releases</u>		
Relay on target	H	
Depress lase button(s)	H	
<u>Case 9.3.B. TC corrects range</u>		
Squeeze trigger(s) with reticle on target	N	No TC to correct range. Simulated TC provides only fire commands.

<u>Option 9.4. Engage target given no range display (loss of symbology)</u>		
Top Gun does not simulate loss of symbology.		

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
Top Gun does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
Top Gun does not simulate cant sensor failure.		

<u>Option 9.7. Lead angle sensor failure</u>		
Top Gun does not simulate lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
Top Gun does not simulate spontaneous GPS failure. The Instructor can program Top Gun so that the GPS is disabled--GPS automatically switches to TIS after one round is fired.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
<u>Case 9.9.A. Use GAS with precision techniques</u>		
Top Gun does not simulate spontaneous GPS/TIS failure. The Instructor can program Top Gun so that the GPS and TIS are disabled; however this does not force the gunner to make the decision to use the GAS.		
<u>Case 9.9.B. Use GAS with battlesight gunnery</u>		
Top Gun does not support battlesight gunnery. Cannot index battlesight range or ammo; no CCP.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.10. Engage target using GAS</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	N	FIRE CONTROL MODE switch is painted on.
• LRF: SAFE	H	
• GUN SELECT: MAIN	P	Switch is represented, does not work in coax. Indicator lights painted on.
• AMMO SELECT: as announced	N	AMM SELECT switch is painted on. All engagements use SABOT.
• RETICLE select: announced ammo	N	RETICLE SELECT switch not represented. Monocular sight is simulated by monitor which is viewed binocularly.
Sight through GAS	P	Toggle switch is used to select GPS/TIS/GAS.
Grasp palm switches	H	
Announce IDENTIFIED	P	Can perform although remainder of crew is not present.
Lay announced range line on target	H	
Begin tracking moving target	H	
Apply lead to moving target	H	
Listen for FIRE	H	
Announce ON THE WAY	P	Can perform, although remainder of crew is not present.
Squeeze trigger(s) with reticle aiming point on target	H	
Continue tracking	H	

<u>Option 9.11. Engage target given stabilization system failure (emergency mode)</u>		
Top Gun does not simulate stabilization system failure.		

<u>Option 9.12. Engage target given turret power failure</u>		
Top Gun does not simulate turret power failure; no manual controls.		

Activity 10. ENGAGE TARGET FROM THE TC POSITION		
Top Gun does not provide TC station.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check/adjust MRS	<u>N</u>	<u>CCP and MRS lever not represented.</u>
<u>Case 11.A. Stationary</u>		
No gunner's actions specified.		
<u>Case 11.B. Moving</u>		
Top Gun does not simulate owntank movement.		
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
Top gun does not simulate Loader's station or M240 machinegun. No gunner's actions specified.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
Top Gun does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
Top Gun does not simulate smoke grenade launcher.		

<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
Top Gun does not simulate vehicle exhaust smoke. No gunner's actions specified.		
Activity 15. SUBMIT REPORTS		
No gunner's actions specified.		

ASSESSMENT OF GUNNER ACTIVITIES ON VIGS

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
VIGS does not support gunnery's preops. There is no time to conduct preops since the controls are functional only during the course of an exercise.		
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
VIGS does not support pre-fire checks. There is no time to conduct pre-fire checks since controls are functional only during the course of an exercise.		
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search		
<u>Option 3.1.1. Open hatch - day</u>		
VIGS does not simulate open-hatch viewing.		
<u>Option 3.1.2. Closed hatch - day</u>		
Select 3X GPS/TIS magnification	<u>N</u>	<u>Magnification lever painted on in 10X position.</u>
Search on gun axis using GPS	<u>N</u>	<u>No time to search, view in gunner's sight is "slewed" at beginning of exercise so that target is visible.</u>
Alternate using GPS with TIS	<u>N</u>	<u>Exercises are either day or thermal. Cannot use both channels during an exercise.</u>
Execute search techniques to acquire targets	<u>N</u>	<u>No time to search, view in gunner's sight is "slewed" at beginning of exercise so that target is visible.</u>
<u>Option 3.1.3. Night</u>		
Search on gun axis using TIS	<u>N</u>	<u>No time to search, view in gunner's sight is "slewed" at beginning of exercise so that target is visible.</u>
Part 3.2. Detection/Location/Identify Target(s)		
Detect target(s)/signature(s)/obstacles	<u>N</u>	<u>Fire command given at start of exercise. View in gunner's sight is "slewed" at beginning of exercise so that target is visible.</u>
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		
• IFFN	<u>N</u>	<u>All targets are threat.</u>
• Nomenclature	<u>N</u>	<u>Fire command given at start of exercise. Limited target array.</u>
If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	<u>N</u>	<u>Fire command given at start of exercise. Limited target array. Traverse method is supported, other methods are not.</u>
Confirm acquisition report	<u>N</u>	<u>Fire command given at start of engagement. No crewmen to provide acquisition report.</u>
Estimate range to evaluate LRF return	<u>M</u>	<u>Clarity of videodisc image varies. Range cues provided are substantially different from real-world cues.</u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.3. Evaluate Situation		
No gunner actions specified.		
<hr/>		
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Precision engagement - moving (offense)</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>N</u>	<u>FIRE CONTROL MODE switch not represented.</u>
• LRF: ARM LAST RTN	<u>H</u>	<u></u>
• GPS: 3X	<u>N</u>	<u>Magnification lever is pointed on in 10X position.</u>
• GUN SELECT: MAIN	<u>H</u>	<u></u>
• AMMO SELECT: as announced	<u>H</u>	<u></u>
Sight through GPS	<u>H</u>	<u></u>
Grasp palm switches	<u>H</u>	<u></u>
Look through GPS	<u>H</u>	<u></u>
Announce IDENTIFIED	<u>P</u>	<u>Can announce, although TC is not present.</u>
Switch GPS to 10X	<u>N</u>	<u>Magnification lever is painted on in 10X position.</u>
Lay on center mass of target	<u>H</u>	<u></u>
Track moving target	<u>P</u>	<u>No simulation of lead sensor system. Can develop a tendency to ambush targets.</u>
Listen for driver alerts	<u>N</u>	<u>Driver is not represented</u>
Depress lase button(s)	<u>H</u>	<u></u>
Evaluate range display	<u>P</u>	<u>Range cues differ from real-world.</u>
Check ready-to-fire and fault symbols	<u>H</u>	<u>Ready-to-fire symbol works correctly. LRF malfunction not simulated therefore fault symbol not represented.</u>
Make control lay	<u>H</u>	<u></u>
Listen for UP	<u>H</u>	<u></u>
Listen for FIRE	<u>H</u>	<u></u>
Announce ON THE WAY	<u>P</u>	<u>Can perform, although remainder of crew is not present.</u>
Squeeze trigger(s)	<u>H</u>	<u></u>
Continue tracking	<u>P</u>	<u>No simulation of lead sensor system. Can develop a tendency to ambush targets.</u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Precision engagement - defense</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	N	FIRE CONTROL MODE switch is not represented.
• LRF: ARM LAST RTN	H	
• GPS: 3X	N	Magnification lever is painted on in 10X position.
• GUN SELECT: MAIN	H	
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GAS to determine when gun clears defilade	N	
Announce DRIVER STOP	N	Driver not represented.
Look through GPS	H	
Announce IDENTIFIED	P	Can announce, although TC is not present.
Switch GPS to 10X	N	Magnification lever is painted on in 10X position.
Lay on center mass of target	H	
Track moving target	P	No simulation of lead sensor system. Can develop a tendency to ambush targets.
Depress lase button(s)	H	
Evaluate range display	P	Range cues differ from real-world.
Check ready-to-fire and fault symbols	P	Ready-to-fire symbol works correctly. LRF malfunction not simulated, therefore fault symbol not represented.
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	P	Can announce, although remainder of crew is not present.
Squeeze trigger(s)	H	
Continue tracking	P	No simulated of lead sensor system. Can develop a tendency to ambush targets.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Announce CANNOT IDENTIFY or does not respond	<u>N</u>	TC is not present and therefore will not respond. View in gunner's sight is "slewed" at beginning of exercise so that target is visible.
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
Announce IDENTIFY <DIFFERENT TARGET>	<u>N</u>	TC is not present and therefore will not respond. View in gunner's sight is "slewed" at beginning of exercise so that target is visible.

<u>Option 4.4. Use TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings:		
• THERMAL MODE: ON	<u>H</u>	
• FLTR/CLEAR/SHTR: SHTR	<u>P</u>	During TIS engagements no image is presented if switch is set to FLTR or CLEAR.
• THERMAL MAGNIFICATION: 3 TO 10X	<u>N</u>	Magnification lever is painted on in 10X position.
• POLARITY SWITCH: WHITE or BLACK HOT, as desired	<u>H</u>	
• SENSITIVITY/CONTRAST/FOCUS for best image	<u>M</u>	Focus ring not represented. Sensitivity control does not work.

Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	No recoil, therefore sight picture is not lost. No obscuration effects.
Observe/announce strike of every round	<u>P</u>	Bursts are cartoonish and of uniform size. Hits are sometimes difficult to detect.

<u>Option 5.1. Reengage</u>		
Announce REENGAGING	<u>P</u>	Can announce, although remainder of crew not present.
Release/reengage palm switches	<u>P</u>	Can be performed, but releasing/reengaging palm switches has no effect on engagement.

- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE (continued)		
<u>Option 5.2. Standard adjustment</u>		
Observe/announce deflection and range error	<u>M</u>	Difficult to accurately determine deflection & range error. There are no degraded mode exercises to cue gunner to use standard adjust.
Release/reengage palm switches	<u>P</u>	Can be performed, but releasing/reengaging palm switches has no effect on engagement.
Adjust 1 mil deflection	<u>M</u>	Can be performed, although standard adjustment will cause a miss.
Adjust 1 mil (GPS)/ Adjust 200 meters range (GAS)	<u>M</u>	Can be performed, although standard adjustment will cause a miss.
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		
<u>Option 5.3. TC adjustment</u>		
VIGS does not provide a TC station nor simulate TC engagements.		
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>N</u>	FIRE CONTROL MODE switch not represented.
• LRF ARM: ARM LST RTN	<u>H</u>	
• GPS: 3X	<u>N</u>	Magnification lever is painted on in 10X position.
• GUN SELECT: COAX	<u>H</u>	
Grasp palm switches	<u>H</u>	
Announced IDENTIFIED	<u>P</u>	Can announce, although TC not present.
Switch GPS to 10X	<u>N</u>	Magnification lever is painted on in 10X position.
Lay center of target	<u>H</u>	
Depress lase button(s)	<u>H</u>	
Evaluate range display	<u>r</u>	CGI, range cues differ substantially from real world.
Listen for FIRE	<u>H</u>	
Announce ON THE WAY	<u>P</u>	Can announce, although remainder of crew is not present.
Fire 20-30 rounds (5-6 tracers) to destroy/suppress point/area targets	<u>M</u>	Targets cannot be "suppressed." Tracers not clearly visible. Difficult to determine target coverage.
Adjust fire as needed	<u>M</u>	Effect of MG fire (smoke, blower) not represented. Tracers not clearly visible; difficult to accurately adjust fire.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, adjust fire as described in Activity 5		<u>See comments listed under Activity 5.</u>
Engage second target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>

Activity 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS MAIN GUN ENGAGEMENTS)

VIGS does not provide TC station or simulate cal .50, therefore does not support simultaneous engagements.

Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES

Option 9.1. Engage targets using battlesight gunnery

VIGS does not support battlesight gunnery. TC voice does not announce battlesight engagements. Battlesight range and ammo cannot be indexed.

Option 9.2. Engage target given ineffective LRF

VIGS does not simulate ineffective LRF.

Option 9.3. Engage target given multiple returns from LRF

Depress lase button(s)	<u>H</u>	
If multiple return symbol appears in GPS, announce RANGE <IN METERS>	<u>H</u>	
Switch LRF setting in accordance with TC instructions	<u>N</u>	<u>No TC to provide instructions.</u>
<u>Case 9.3.A. Gunner releases</u>		
Relay on target	<u>H</u>	
Depress lase button(s)	<u>H</u>	
<u>Case 9.3.B. TC corrects range</u>		
Squeeze triggers with reticle on target	<u>N</u>	<u>VIGS does not provide TC station or simulate TC actions.</u>

Option 9.4. Engage target given no range display (loss of symbology)

VIGS does not simulate loss of symbology.

Option 9.5. Engage target given crosswind sensor failure

VIGS does not simulate crosswind sensor failure.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.6. Engage target given cant sensor failure</u>		
VIGS does not simulate cant sensor failure.		

<u>Option 9.7. Lead angle sensor failure</u>		
VIGS does not simulate lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
VIGS does not simulate GPS failure.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
VIGS does not simulate GPS/TIS failure.		

<u>Option 9.10. Engage target using GAS</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>N</u>	<u>FIRE CONTROL MODE switch not represented.</u>
• LRF: SAFE	<u>H</u>	
• GUN SELECT: MAIN	<u>H</u>	
• AMMO SELECT: as announced	<u>H</u>	
• RETICLE select: announced ammo	<u>H</u>	
Sight through GAS	<u>H</u>	
Grasp palm switches	<u>H</u>	
Announce IDENTIFIED	<u>P</u>	<u>Can perform although TC is not present.</u>
Lay announced range line on target	<u>H</u>	
Begin tracking moving target	<u>P</u>	<u>No simulated of lead sensor system, can develop a tendency to ambush targets.</u>
Apply lead to moving target	<u>H</u>	
Listen for FIRE	<u>H</u>	
Announce ON THE WAY	<u>P</u>	<u>Can announce, although remainder of crew is not present.</u>
Squeeze trigger(s) with reticle aiming point on target	<u>H</u>	
Continue tracking	<u>P</u>	<u>No simulation of lead sensor system, can develop a tendency to ambush targets.</u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.11. Engage target given stabilization system failure (emergency mode)</u>		
VIGS does not simulate stabilization system failure. Applying lead to a target will result in a miss.		

<u>Option 9.12. Engage target given turret power failure</u>		
VIGS does not simulate turret power failure; no manual controls.		
<hr/>		
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
VIGS does not provide TC station.		
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Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check/adjust MRS	<u> N </u>	<u>CCP and MRS lever not represented.</u>
<u>Case 11.A. Stationary</u>		
No gunner's actions specified.		
<u>Case 11.B. Moving</u>		
Index battlecarry ammo	<u> P </u>	<u>Can be performed, although TC does not announce battlecarry ammo.</u>
Announce <AMMO> INDEXED	<u> P </u>	<u>Can announce, although remainder of crew not represented.</u>
<hr/>		
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
VIGS does not simulate Loader's M240 machinegun. No gunner actions specified.		
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Activity 13. IMMEDIATE ACTION- MISFIRE		
VIGS does not simulate main gun misfire.		
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RATING

COMMENTS

Activity 14. EMPLOY SMOKE

Option 14.1. Use M250 Smoke Grenade Launcher

VIGS does not simulate smoke grenade launcher.

Option 14.2. Use vehicle engine exhaust smoke system

VIGS does not simulate vehicle exhaust smoke.
No gunner's actions specified.

Activity 15. SUBMIT REPORTS

No gunner's actions specified.

ASSESSMENT OF GUNNER ACTIVITIES ON M-COFT

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
Enter gunner station	<u>M</u>	<u>GNR enters station through curtain at rear of M-COFT.</u>
Operate domelight	<u>H</u>	
Operate intercom	<u>P</u>	<u>Foot switch does not operate.</u>
Install coax	<u>N</u>	<u>Coax cannot be installed, but is simulated.</u>
Adjust seats	<u>H</u>	
Adjust browpads	<u>P</u>	<u>Browpads have extra "play" due to simulation of recoil.</u>
Adjust chestrest	<u>H</u>	
Power up GNR station	<u>M</u>	<u>Turret traverse and main gun travel locks are not simulated. LDR's GUN/TURRET DRIVE switch is not simulated. Hydraulic pressure gage is painted on and reads 1600 psi.</u>
Perform GPS function check	<u>P</u>	<u>LDR's GUN/TURRET DRIVE switch is not simulated.</u>
Adjust GPS	<u>H</u>	
Perform computer self-test	<u>P</u>	<u>Cant and crosswind failures cannot be simulated. Hydraulic pressure gage is painted on and reads 1600 psi.</u>
Perform computer data check	<u>P</u>	<u>Hydraulic pressure gage is painted on and reads 1600 psi.</u>
Perform TIS check	<u>H</u>	
Perform GAS adjust	<u>H</u>	
Check power control handles	<u>H</u>	
Check manual elevation/traverse cranks	<u>P</u>	<u>Turret traverse and main gun travel locks are not simulated. Traverse resistance is constant and too light.</u>
Perform lead system check	<u>P</u>	<u>No turret motion after handles are centered.</u>
Perform firing circuit check	<u>N</u>	<u>Firing circuit tester/indicator light, breechblock, and LDR's control panel are not represented.</u>
Perform crosswind sensor check	<u>N</u>	<u>Crosswind sensor is not represented. Crosswind cannot be induced.</u>
Perform hydraulic pressure check	<u>N</u>	<u>Cannot shut off "engine." Hydraulic pressure gage is painted on and reads 1600 psi.</u>

	RATING	COMMENTS
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Boresight main gun	M	GNR practices incorrect procedure with respect to averaging. Pye-Watson device not represented. Tank cannot be on unlevel ground. Breech cannot be opened. Machineguns cannot be cleared. Boresight panel is exactly 1200m with range preindexed in the fire control system.
Zero coax	M	GNR cannot load coax. "Tracers" are too tightly clustered. Normally do not zero on boresight target. Software "glitch" prevents machinegun strike errors from being adjusted out.
Report weapon status	H	
Index battlecarry ammo on AMMO SEL switch	H	
Introduce battlesight range into CCP	H	
<hr/>		
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	M	No mission scenarios per se to be briefed on.
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<u>Option 2.2. Prepare for defense</u>		
Inspect terrain through GPS/TIS	M	Computer generated image (CGI) terrain is cartoonish and objects are subject to misinterpretation.
Check GAS clearance	P	All defensive engagements start behind berm; no need to check. Computer generated image (CGI) terrain is cartoonish and objects are subject to misinterpretation.
Learn TRP locations/ranges	M	No time to learn TRPs.
<hr/>		
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search		
<u>Option 3.1.1. Open hatch - day</u>		
M-COFT does not simulate open-hatch viewing.		
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<u>Option 3.1.2. Closed hatch - day</u>		
Select 3X Gr3/TIS magnification	P	Shapes and details of objects change as a function of magnification.
Search on gun axis using GPS	P	CGI is cartoonish, limits realism.
Alternate using GPS with TIS	P	Thermal image is too good/consistent.
Execute search techniques to acquire targets	H	
<hr/>		
<u>Option 3.1.3. Night</u>		
Search on gun axis using TIS	P	CGI is cartoonish, limits realism.
<hr/>		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.2. Detection/Location/Identify Target(s)		
Detect target(s)/signature(s)/obstacles	<u>M</u>	Limited array of threat targets. Gun flash used to indicate target is present, makes target detection easier; no other target signatures. CGI is cartoonish, limits realism.
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		Limited array of targets; makes M-COFT task easier than combat task. Limited detail on targets; makes M-COFT task harder than combat task.
• IFFN	<u>P</u>	
• Nomenclature	<u>P</u>	Limited array of targets; makes M-COFT task easier than combat task. Limited detail on targets; makes M-COFT task harder than combat task.
If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	<u>P</u>	Traverse, clock, and sector methods supported; reference point and grid methods are not.
Confirm acquisition report	<u>P</u>	Can receive acquisition report only from TC.
Estimate range to evaluate LRF return	<u>M</u>	CGI range cues differ substantially from real-world.

Part 3.3. Evaluate Situation		
No gunner actions specified.		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Precision engagement - moving (offense)</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: ARM LAST RTN	P	M-COFT does not penalize gunner for arming LRF before fire command.
• GPS: 3X	H	
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire command.
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	P	Shapes and details of objects change as a function of magnification.
Lay on center mass of target	H	
Track moving target	P	No turret motion cues. M-COFT control handles are too sensitive; real handles are "smoother."
Listen for driver alerts	N	Verbal alerts from driver are not simulated.
Depress laser button(s)	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Check ready-to-fire and fault symbols	H	
Make control lay	H	
Listen for UP	H	Computer synthesizes loader's voice.
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Precision engagement - defense</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: ARM LAST RTN	P	M-COFT does not penalize gunner for arming LRF before fire command.
• GPS: 3X	H	
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire command.
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GAS to determine when gun clears defilade	H	
Announce DRIVER STOP	H	
Look through GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	P	Shapes and details of objects change as a function of magnification.
Lay on center mass of target	H	
Track moving target	P	No turret motion cues. M-COFT control handles are too sensitive; real handles are "smoother."
Depress lase button(s)	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Check ready-to-fire and fault symbols	H	
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Announce CANNOT IDENTIFY or does not respond	<u>H</u>	
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
Announce IDENTIFY <DIFFERENT TARGET>	<u>H</u>	

<u>Option 4.4. Use TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings:		
• THERMAL MODE: ON	<u>P</u>	<u>Thermal image is too good/consistent.</u>
• FLTR/CLEAR/SHTR: SHTR	<u>P</u>	<u>Thermal image is too good/consistent.</u>
• THERMAL MAGNIFICATION: 3 TO 10X	<u>P</u>	<u>Thermal image is too good/consistent.</u>
• POLARITY SWITCH: WHITE or BLACK HOT, as desired	<u>P</u>	<u>Thermal image is too good/consistent.</u>
• SENSITIVITY/CONTRAST/FOCUS for best image	<u>P</u>	<u>Thermal image is too good/consistent.</u>

Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	<u>Simulated recoil is too weak to cause total loss of sight picture.</u> <u>Other effects of firing (smoke, smell) are not simulated.</u>
Observe/announce strike of every round	<u>P</u>	<u>Round bursts are uniform, cartoonish flashes.</u> <u>Target observation is easy, target changes colors when hit (green to black).</u> <u>Time limitations preclude observation.</u>

<u>Option 5.1. Reengage</u>		
Announce REENGAGING	<u>H</u>	
Release/reengage palm switches	<u>H</u>	
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

<u>Option 5.2. Standard adjustment</u>		
Observe/announce deflection and range error	<u>H</u>	
Release/reengage palm switches	<u>H</u>	
Adjust 1 mil deflection	<u>H</u>	
Adjust 1 mil (GPS)/ Adjust 200 meters range (GAS)	<u>H</u>	
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE (continued)		
<u>Option 5.3. TC adjustment</u>		
Release/reengage palm switches	<u>H</u>	
Apply TC correction	<u>H</u>	
- - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		

**Activity 6. ENGAGE A SINGLE
TARGET WITH THE COAX**

Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>H</u>	No manual mode; emergency and normal modes only.
• LRF ARM: ARM LST RTN	<u>P</u>	M-COFT does not penalize gunner for arming LRF before fire command.
• GPS: 3X	<u>H</u>	
• GUN SELECT: COAX	<u>P</u>	M-COFT does not penalize gunner for arming coax before fire command.
Grasp palm switches	<u>H</u>	
Announced IDENTIFIED	<u>H</u>	
Switch GPS to 10X	<u>P</u>	Shapes and details of objects change as a function of magnification.
Lay center of target	<u>H</u>	
Depress lase button(s)	<u>H</u>	
Evaluate range display	<u>P</u>	CGI range cues differ substantially from real-world.
Listen for FIRE	<u>H</u>	
Announce ON THE WAY	<u>H</u>	
Fire 20-30 rounds (5-6 tracers) to destroy/suppress point/area targets	<u>M</u>	Targets cannot be "suppressed." Troops are represented as flashing dots.
Adjust fire as needed	<u>M</u>	"Effects" of machinegun fire (smoke, blower) are not represented. Tracer rounds are not dispersed enough, making M-COFT easier than M1.

**Activity 7. ENGAGE MULTIPLE TARGETS
WITH THE MAIN GUN**

Engage first target using precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
If first target is not destroyed, adjust fire as described in Activity 5		See comments listed under Activity 5.
Engage second target using precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS MAIN GUN ENGAGEMENTS)		
<u>Option 8.1. Simultaneous targets</u>		
Engage main gun targets using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Adjust fire using standard adjustment as described in Option 5.2		<u>See comments listed under Activity 5, Option 5.2.</u>
If target is destroyed, announce: TARGET--CEASE FIRE	<u>H</u>	
<hr/>		
<u>Option 8.2. Cal .50 targets</u>		
Aid in adjusting TC's weapon	<u>H</u>	
<hr/>		
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>H</u>	
• LRF: SAFE	<u>P</u>	<u>M-COFT does not penalize gunner for arming LRF before fire command.</u>
• GPS: 3X	<u>H</u>	
• GUN SELECT: MAIN	<u>P</u>	<u>M-COFT does not penalize gunner for arming main gun before fire command.</u>
• AMMO SELECT: battlecarry ammo	<u>H</u>	
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<hr/>		
<u>Option 9.2. Engage target given ineffective LRF</u>		
<u>Case 9.2.A. Use battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1)		<u>See comments listed under Option 9.1.</u>
<u>Case 9.2.B. TC indexes range</u>		
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Announce IDENTIFIED	<u>H</u>	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Case 9.2.C. GNR indexes range</u>		
Open CCP door	<u>H</u>	
Press RANGE button	<u>H</u>	
Enter <RANGE>	<u>H</u>	
Press ENTER button	<u>H</u>	
Close CCP door	<u>H</u>	
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<u>Case 9.2.D. GNR manually applies range</u>		
Engage target using GAS (Option 9.10)		<u>See comments listed under Option 9.10.</u>

<u>Option 9.3. Engage target given multiple returns from LRF</u>		
Depress lase button(s)	<u>H</u>	
If multiple return symbol appears in GPS, announce RANGE <IN METERS>	<u>H</u>	
Switch LRF setting in accordance with TC instructions	<u>H</u>	
<u>Case 9.3.A. Gunner releases</u>		
Relay on target	<u>H</u>	
Depress lase button(s)	<u>H</u>	
<u>Case 9.3.B. TC corrects range</u>		
Squeeze trigger(s) with reticle on target	<u>H</u>	

<u>Option 9.4. Engage target given no range display (loss of symbology)</u>		
M-COFT does not simulate loss of symbology.		

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
M-COFT does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
M-COFT does not simulate cant sensor failure.		

<u>Option 9.7. Lead angle sensor failure</u>		
M-COFT does not simulate lead angle sensor failure.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
M-COFT does not simulate GPS failure by itself; it does simulate GPS/TIS failure.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
<u>Case 9.9.A. Use GAS with precision techniques</u>		
Engage targets using GAS gunnery (Option 9.2)		<u>See comments listed under Option 9.2.</u>
<u>Case 9.9.B. Use GAS with battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1) but with GAS instead of GPS		<u>See comments listed under Option 9.1.</u>

<u>Option 9.10. Engage target using GAS</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: SAFE	P	M-COFT does not penalize gunner for arming LRF before fire commands.
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire commands.
• AMMO SELECT: as announced	H	
• RETICLE select: announced ammo	H	
Sight through GAS	H	
Grasp palm switches	H	
Announce IDENTIFIED	H	
Lay announced range line on target	H	
Begin tracking moving target	P	M-COFT control handles are too sensitive, real handles are "smoother."
Apply lead to moving target	P	M-COFT control handles are too sensitive, real handles are "smoother."
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s) with reticle aiming point on target	H	
Continue tracking	H	

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.11. Engage target given stabilization system failure (emergency mode)</u>		
Set/check switches:		
• FIRE CONTROL MODE: EMERGENCY	H	
• LRF: ARM LST RTN	P	M-COFT does not penalize gunner for arming LRF before fire commands.
• GPS: 3X	H	
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire commands.
• AMMO SELECT: as announced	H	
Sight through GAS	H	
Grasp palm switches	H	
Announce IDENTIFIED	H	
Begin tracking moving target	P	M-COFT control handles are too sensitive; real handles are "smoother."
Apply lead to moving target	P	M-COFT control handles are too sensitive; real handles are "smoother."
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s) with reticle aiming point on target	H	
Continue tracking	H	

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.12. Engage target given turret power failure</u>		
Set/check switches:		
• FIRE CONTROL MODE: MANUAL	H	
• GPS: 3X	H	
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire commands.
• AMMO SELECT: as announced	H	
Sight through GAS	H	
Traverse/elevate gun with manual controls	P	Traverse resistance is too light and constant.
Announce IDENTIFIED	H	
Lay announced range line on target	H	
Begin tracking moving target	P	
Apply lead to moving target	P	
Listen for FIRE	H	
Announce ON THE WAY	H	
Press elevation knob firing trigger with reticle aiming point on target	H	
If gun fails to fire, vigorously turn blasting machine handle 3 - 4 times	H	
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
<u>Case 10.A. Gunner cannot identify target</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• TIS: STBY/ON	H	
• LRF: ARM LAST RTN	P	M-COFT does not penalize gunner for arming LRF before fire command.
• GPS: 10X	H	
• GUN SELECT: MAIN	P	M-COFT does not penalize gunner for arming main gun before fire command.
• AMMO SELECT: as announced	H	
<u>Case 10.B. Three-man crew</u>		
No gunner's actions specified.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check/adjust MRS	<u>M</u>	AUX PWR is not an option; engine is always on. Gun movements resulting from MRS update are not simulated.
<u>Case 11.A. Stationary</u>		
No gunner's actions specified		
<u>Case 11.B. Moving</u>		
Index battlecarry ammo	<u>H</u>	
Announce <AMMO> INDEXED	<u>H</u>	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
M-COFT does not simulate Loader's M240 machinegun. No gunner's actions specified.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
M-COFT does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
(If given command by TC) Traverses turret to firing position	<u>H</u>	
<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
M-COFT does not simulate vehicle exhaust smoke. No gunner's actions specified.		
Activity 15. SUBMIT REPORTS		
No gunner's actions specified.		

ASSESSMENT OF TANK COMMANDER ACTIVITIES ON M-COFT

	RATING	COMMENTS
Activity 1. PREPARE STATIONS FOR OPERATION		
Enter station	N	TC enters station through curtains at rear of M-COFT.
Power up CWS/turret	P	Cannot practice task with AUX HYDR POWER; "engine" always runs.
Operate domelight	H	
Operate intercom	P	Cannot turn on amplifier at LDR's station. INT switch does not function.
Adjust seat	H	
Adjust hatch	N	"Hatch" does not operate, is sealed shut.
Adjust platform	F	Cannot open hatch to adjust platform.
Install TC's weapon	N	TC's cal .50 cannot be installed, but is simulated.
Adjust kneeguard	H	
Adjust GPSE headrest/lens	P	Browpads have extra play due to "recoil." View changes as TC moves sights in/out due to electronic eye not present in MI.
Check manual range controls	H	
Check power control handle	P	No motion cues.
Check CWS in power/manual modes	P	Only Forward Unity Periscope is represented.
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Supervise/assist boresight	N	TC's primary role (manipulate muzzle boresight device) cannot be performed. Cannot load TC's cal .50.
Boresight TC's weapon	M	Cannot sight through barrel or check headspace/timing. Boresight lesson is initialized with target at exactly 500m and with the range preindexed.
Zero TC's weapon	M	Butterfly safety switch on MG is not represented. Software "glitch" prevents MG strike errors from being adjusted out. Normally do not zero on boresight targets.
Select/announce battlecarry AMMO, RANGE	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE- TO-FIRE CHECKS (continued)		
<u>Option 2.1. Prepare for offense</u>		
Receive offensive mission/ formation/movement/commo	<u>M</u>	May receive some commo from I/O acting as platoon leader. No mission scenarios per se to be briefed on.
Analyze terrain	<u>N</u>	No time within exercise to analyze terrain.
Check map overlay	<u>N</u>	No maps of simulated terrain.
Brief crew	<u>M</u>	No mission scenarios per se to provide briefing on. Loader and driver are not present.
Control driver, if necessary to maintain position in platoon formation and to exploit cover and concealment	<u>M</u>	TC can only tell driver to start/stop; no real control over movement. M-COFT is limited to single tank gunnery. No real cover or concealment.

<u>Option 2.2. Prepare for defense</u>		
Issue driver commands to move with platoon to occupy battle position	<u>N</u>	M-COFT is limited to single tank gunnery. Cannot select battle position.
Receive defensive mission/ position commo	<u>M</u>	May receive some commo from I/O acting as platoon leader. No mission scenarios per se to be briefed on.
Prepare primary/alternate/ supplementary positions	<u>N</u>	Cannot prepare positions.
Analyze terrain	<u>N</u>	No time within exercise to analyze terrain.
Prepare tank sketch card	<u>N</u>	No time within exercise to prepare sketch range card.

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search for Target(s)**Option 3.1.1. Search open hatch -
day

M-COFT does not simulate open hatch viewing.

	RATING	COMMENTS
Activity 3. ACQUIRE TARGET(S) (continued)		
<u>Option 3.1.2. Search closed hatch - day</u>		
Search 360°	M	Must use FUP and power or manual traverse; experienced TC's in M1 would use all UPs and not traverse. Targets appear only in forward sector of view.
Perform air guard duties	M	Must use FUP and power or manual traverse; experienced TC's in M1 would use all UPs and not traverse. Targets appear only in forward sector of view. Cannot view open hatch. Only one aircraft target represented: HIND-D.
Execute search techniques	P	Limited by having only one UP.
<u>Option 3.1.3. Search at night</u>		
Search 360°	M	Must use FUP and power or manual traverse; experienced TC's in M1 would use all UPs and not traverse. Targets appear only in forward sector of view.
Use off-center vision	N	Applied to open hatch viewing.
<u>Part 3.2. Detect/Locate/Identify Target(s)</u>		
Detect target(s)/signature(s)/obstacle(s)	M	Gun flash used to indicate target is present, makes detection easier; no other target signatures. Limited array of threat targets. CGI is cartoonish, limits realism.
Locate target(s)	H	
Identify target(s) by:		Limited array of targets; makes M-COFT task easier than combat task.
• IFFN	M	Limited detail on targets; makes M-COFT harder than combat task.
• Nomenclature	P	Limited array of targets; makes M-COFT task easier than combat task. Limited detail on targets; makes M-COFT harder than combat task.
Note number of target	H	
Classify multiple targets as most dangerous/dangerous/least dangerous	H	
Confirm acquisition report	P	Can receive acquisition report only from gunner.
Estimate range to select weapon(s) and to evaluate LRF return	M	CGI range cues differ substantially from real-world.
Send contact report to platoon leader	P	M-COFT limited to single tank gunnery. I/O may act as platoon leader.

	RATING	COMMENTS
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.3. Evaluate Situation		
Decide whether or not to engage contingent on:	N	M-COFT limited to single tank gunnery. All threat targets are to be engaged.
• Platoon mission		
• Platoon fire plan		
• Platoon leader command		
Select the appropriate weapon/ammunition and the firing mode (precision/degraded) contingent on:	P	Loader and loader's M240 machinegun are not represented. System will score error if SABOT is selected; doctrine allows SABOT.
• Target range		
• Type of target (hard/soft, point/area)		
• Tank status (ammo, malfunctions)		
Determine crewman (GNR, TC, LDR) and the type of fire command (single, multiple, or simultaneous) contingent on:	P	Loader and loader's M240 machinegun are not represented.
• Number of targets		
• Target classification		
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Decide whether to engage target while moving or from a short halt	M	TC can stop tank only in degraded ("stab out") exercises. Tank cannot move into defilade.
If engaging from a short halt, Issue driver command: DRIVER STOP	H	
Relay any action drill command	N	Cannot execute action drill; M-COFT is limited to single tank gunnery.
Issue fire command: GUNNER <AMMO> <TARGET>	P	System will incorrectly score an error for firing SABOT at HIND-D.
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	Computer synthesizes loader's voice.
Announce FIRE, or FIRE, FIRE <ALTERNATE AMMO>	H	

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Issue fire command: GUNNER <AMMO> <TARGET>	P	System will incorrectly score an error for firing SABOT at HIND-D.
Announce DRIVER MOVE OUT, GUNNER TAKE OVER	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	Computer synthesizes loader's voice.
Announce FIRE, or FIRE,FIRE <ALTERNATE AMMO>	H	

<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Direct gunner onto target using one of the following techniques:		
• Verbal command: TRAVERSE <LEFT or RIGHT>, STEADY, ON	H	
• TRPs	P	TRPs are cartoonish and difficult to distinguish.
• Announce WATCH MY TRACERS and use .50 caliber tracers to point to target	H	
or		
Announce FROM MY POSITION and proceed with TC engagement (see Activity 10)		See comments listed under Activity 10.
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
If GNR is correct, issue a correction to the fire command	H	
If GNR identifies the wrong target, treat as Case 4.3.A. and proceed		See comments listed under Case 4.3.A.

<u>Option 4.4. Engage target using TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2)		See comments listed under Options 4.1 and 4.2.

	RATING	COMMENTS
Activity 5. ADJUST FIRE		
Recover sight picture	M	Simulated recoil is too weak to cause total loss of sight picture. Other effects of firing (smoke, smell) are not simulated.
Observe strike of round	P	Round bursts are uniform, cartoonish flashes. Target observation is easy, target changes color when hit (green to black). Time limitations preclude observations.
If TARGET was observed, determine whether or not target was destroyed	P	Cannot hit target without destroying it; no mobility kills.

<u>Option 5.1. Use reengage technique</u>		
Evaluate range	P	CGI range cues differ substantially from real-world.
Announce FIRE	H	

<u>Option 5.2. Use standard adjustment</u>		
No TC actions specified.		

<u>Option 5.3. Use TC adjustment</u>		
Issue subsequent fire command to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	H	
If target is destroyed or exposure too long, command CEASE FIRE	H	
If in defensive posture, command DRIVER, BACK UP	H	

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Issue fire command: GUNNER COAX <TARGET>	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Announce FIRE	H	
Monitor/evaluate engagement	H	
Command CEASE FIRE	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Issue fire command: GUNNER <AMMO> <NUMBER> <TARGETS>, <RIGHT/LEFT> <TARGET> FIRST	<u>H</u>	
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, adjust fire (Activity 5)		<u>See comments listed under Activity 5.</u>
If first target is destroyed, announce <NEXT> TARGET	<u>P</u>	<u>Severe M-COFT time standards are difficult to meet; crew may not get this far.</u>
[Continue until all targets are destroyed]		
Announce CEASE FIRE	<u>H</u>	
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
<u>Option 8.1. Simultaneous targets</u>		
Issue fire command: GUNNER <AMMO> <TARGET>, FIRE AND ADJUST	<u>H</u>	
Continue with Option 8.2		
<u>Option 8.2. Cal .50 targets</u>		
Announce: CALIBER .50	<u>H</u>	
Charge TC's weapon	<u>N</u>	<u>Cal .50 charging handle is not represented.</u>
Lay weapon for deflection	<u>H</u>	
Estimate range to target	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Lay CWS sight range line on target	<u>H</u>	
Adjust fire if needed	<u>H</u>	
If target is destroyed, announce: TC COMPLETE	<u>H</u>	

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Issue fire command: GUNNER BATTLESIGHT <TARGET>	H	
Depress MANUAL RANGE BATTLE SGT button	H	
Estimate range to target	M	CGI range cues differ substantially from real-world.
If target outside of +/- 200 meters of battlesight range, enter range change using MAN RNG B/S ADD DROP toggle switch	H	
Check range readout in GPSE	H	
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating LRF display		See comments listed under Activity 4, Options 4.1 and 4.2.

<u>Options 9.2. Engage targets given ineffective LRF</u>		
If LRF fails to function or is rendered ineffective due to environmental conditions or battlefield obscurants, TC chooses using one of the following techniques:		
<u>Case 9.2.A. Use battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1)		See comments listed under Option 9.1.
<u>Case 9.2.B. TC indexes range</u>		
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Estimate range to target	P	CGI range cues differ substantially from real-world.
Index range using MAN RNG B/S ADD/DROP toggle switch	H	
<u>Case 9.2.C. GNR indexes range</u>		
Estimate range to target	M	CGI range cues differ substantially from real-world.
Issue fire command: GUNNER <AMMO> INDEX <RANGE>	H	
<u>Case 9.2.D. GNR manually applies range</u>		
Engage target using GAS (Option 9.10)		See comments listed under Option 9.10.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.3. Engage targets given multiple returns from LRF</u>		
Estimate range	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Evaluate range display	<u>P</u>	<u>CGI range cues differ substantially from real-world.</u>
If range appears incorrect, may instruct GNR to switch LRF setting from ARM LAST RTN to ARM 1ST RTN or v.v.	<u>H</u>	
If multiple return symbol appears in GPSE and displayed range is outside +/- 200 m of estimated range, take either one of the following actions:		
<u>Case 9.3.A. Gunner releases</u>		
Announce RELEASE	<u>H</u>	
<u>Case 9.3.B. TC corrects range</u>		
Correct range using MAN RNG B/S ADD/DROP toggle switch	<u>H</u>	
If displayed range is within +/- 200 m of estimated range, announce FIRE	<u>H</u>	

<u>Option 9.4. Engage targets given no range display (loss of symbology)</u>		
M-COFT does not simulate loss of symbology		

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
M-COFT does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
M-COFT does not simulate cant sensor failure.		

<u>Option 9.7. Engage target given lead angle sensor failure</u>		
M-COFT does not simulate lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
M-COFT does not simulate GPS failure by itself; it does simulate GPS/TIS failure.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.9. Engage target given GPS/TIS failure</u>		
<u>Case 9.9.A. Use GAS with precision techniques</u>		
Engage target using GAS gunnery (Option 9.2)		See comments listed under Option 9.2.
<u>Case 9.9.B. Use GAS with battlesight techniques</u>		
Engage target using battlesight gunnery (Option 9.1)		See comments listed under Option 9.1.

<u>Option 9.10. Engage target using GAS gunnery</u>		
Estimate range to target	N	Range to target is a "given" in M-COFT GAS exercises.
Issue fire command: GUNNER <AMMO> <TARGET> <RANGE>	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Announce FIRE	H	

<u>Option 9.11. Engage target given stabilization system failure (in emergency mode)</u>		
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Announce DRIVER STOP	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Announce FIRE	H	
Announce DRIVER, MOVE OUT	H	

<u>Option 9.12. Engage target given turret power failure</u>		
Announce DRIVER STOP	H	
Issue fire command: GUNNER <AMMO> <TARGET> <DIRECTION> <RANGE>	P	Problems with estimated range; CGI range cues are substantially different than real-world.
Announce FIRE	H	
Announce DRIVER MOVE OUT	H	

	RATING	COMMENTS
Activity 10. ENGAGE TARGETS FROM THE TC POSITION		
(Also Three-Man Crew Engagements)		
Issue one of the following fire commands:		
<u>Case 10.A. Gunner cannot identify target</u>		
FROM MY POSITION	H	
or		
<u>Case 10.B. Three-man crew (no GNR)</u>		
LOAD <AMMO>	H	
Estimate range to target	M	CGI range cues differ substantially from real-world.
Sight through GPSE	H	
Lay on center mass of target	H	
Depress lase button	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Make control lay	H	
Announce ON THE WAY	H	
Squeeze trigger	H	
Announce CEASE FIRE	H	
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Assess battle damage/casualties	N	Battle damage/casualties are not represented.
Determine if and how crew should be reorganized to fight in a three-man configuration	N	M-COFT has only TC and GNR positions.
Issue SPOTREP	M	Limited amount of time; exercise may stop before SPOTREP can be issued.
<u>Case 11.A. If tank is stationary</u>		
Determine whether to move to primary, alternate, or supplementary firing positions	N	Cannot move between firing positions.
<u>Case 11.B. If tank is moving</u>		
Determine changes to route	N	Vehicle follows specific route; TC cannot change route.
Issue driver commands	M	TC can only tell driver to stop start.
Determine appropriate ammo for anticipated targets	H	
Announce PREPARE BATTLECARRY <AMMO> or RELOAD <AMMO>	H	
Enter battlecarry range using the MANUAL BATTLE SGT ADD/DROP toggle switch	H	

RATING

COMMENTS

**Activity 12. ENGAGE TARGETS WITH
LOADER'S M240 MG**

M-COFT does not simulate Loader's M240 machinegun.

**Activity 13. IMMEDIATE ACTION-
MISFIRE**

M-COFT does not simulate main gun misfire.

Activity 14. EMPLOY SMOKEOption 14.1. Use M250 smoke
grenade launcher

Issue order to fire

H

Traverse turret to firing position

H

Announce: GRENADES LAUNCHER

H

Lift safety cover and hold
GRENADE READY/SAFE switch to
READY

H

Announce: SALVO <PATTERN>

H

Press left, right or both push
buttons to fire grenades from
launchers

H

Announce: GRENADES LAUNCHED

H

Option 14.2. Use vehicle engine
exhaust smoke system

M-COFT does not simulate vehicle exhaust smoke.

Activity 15. SUBMIT REPORTS

Operate radio

P

I/O must "play" platoon leader.

ASSESSMENT OF GUNNER ACTIVITIES ON GUARD FIST I

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
<u>Note:</u> GUARD FIST I does not have a specific exercise devoted to performing preops. However, a number of the preops actions can be performed before beginning the engagement exercises.		
Enter gunner station	<u>H</u>	
Operate domelight	<u>H</u>	
Operate intercom	<u>H</u>	
Install coax	<u>N</u>	<u>Coax cannot be installed.</u>
Adjust seats	<u>H</u>	
Adjust browpads	<u>H</u>	
Adjust chestrest	<u>H</u>	
Power up GNR station	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform GPS function check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Adjust GPS	<u>N</u>	<u>Necessary controls are operational only during an exercise.</u>
Perform computer self-test	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform computer data check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform TIS check	<u>N</u>	<u>Necessary controls are operational only during an exercise.</u>
Perform GAS adjust	<u>N</u>	<u>Necessary controls are operational only during an exercise.</u>
Check power control handles	<u>N</u>	<u>Can only be checked within the context of an exercise.</u>
Check manual elevation/traverse cranks	<u>N</u>	<u>Cranks are present, however turret should not move while GUARD FIST I is appended.</u>
Perform lead system check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform firing circuit check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform crosswind sensor check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>
Perform hydraulic pressure check	<u>N</u>	<u>Necessary controls are represented, but are not operational since they are not connected to power supply.</u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Boresight main gun	<u>N</u>	<u>No boresight scenarios.</u>
Zero coax	<u>N</u>	<u>No zeroing scenarios.</u>
Report weapon status	<u>N</u>	<u>Nothing to report since preceding actions cannot be performed.</u>
Index battlecarry ammo on AMMO SEL switch	<u>H</u>	
Introduce battlesight range into CCP	<u>N</u>	<u>CCP is not operational since it is not connected to the power supply.</u>
<hr/>		
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>M</u>	<u>No mission scenarios per se to be briefed on.</u>
<hr/>		
<u>Option 2.2. Prepare for defense</u>		
Inspect terrain through GPS/TIS	<u>M</u>	<u>Minimal amount of time for terrain inspection once exercise begins.</u>
Check GAS clearance	<u>H</u>	
Learn TRP locations/ranges	<u>N</u>	<u>No time to learn TRPs.</u>
<hr/>		
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search		
<u>Option 3.1.1. Open hatch - day</u>		
GUARD FIST I does not simulate open-hatch viewing.		
<hr/>		
<u>Option 3.1.2. Closed hatch - day</u>		
Select 3X GPS/TIS magnification	<u>H</u>	
Search on gun axis using GPS	<u>H</u>	
Alternate using GPS with TIS	<u>P</u>	<u>Switching to thermal does not provide any additional information (e.g., hot spots).</u>
Execute search techniques to acquire targets	<u>H</u>	
<hr/>		
<u>Option 3.1.3. Night</u>		
Search on gun axis using TIS	<u>P</u>	<u>Switching to thermal does not provide any additional at information (e.g., hot spots).</u>
<hr/>		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.2. Detection/Location/Identify Target(s)		
Detect target(s)/signature(s)/obstacles	<u>M</u>	<u>No target signatures (flash, bang, dust, smoke), targets do not fire. No obstacles.</u>
Locate target(s)	<u>H</u>	<u></u>
Identify target(s) making the following determinations:		
• IFFN	<u>N</u>	<u>All targets are threat.</u>
• Nomenclature	<u>P</u>	<u>Limited threat target array.</u>
If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	<u>P</u>	<u>Clock, sector, and traverse methods supported; reference point and grid methods are not.</u>
Confirm acquisition report	<u>H</u>	<u></u>
Estimate range to evaluate LRF return	<u>M</u>	<u>Range cues provided by computer generated image (CGI) are substantially different from real-world.</u>

Part 3.3. Evaluate Situation		
No gunner actions specified.		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Precision engagement - moving (offense)</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	No manual mode; emergency and normal modes only.
• LRF: ARM LAST RTN	H	Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.
• GPS: 3X	H	
• GUN SELECT: MAIN	H	
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	H	
Lay on center mass of target	H	
Track moving target	P	Simulation of stabilization system is not as smooth as stabilization on operational M1.
Listen for driver alerts	H	
Depress lase button(s)	H	
Evaluate range display	P	System does not provide false multiple returns. CGI range cues differ from real-world.
Check ready-to-fire and fault symbols	H	
Make control lay	P	Simulation of stabilization system is not as smooth as stabilization on operational M1.
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	P	Simulation of stabilization system is not as smooth as stabilization on operational M1.

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Precision engagement - defense</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	No manual mode; emergency and normal modes only.
• LRF: ARM LAST RTN	H	Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.
• GPS: 3X	H	
• GUN SELECT: MAIN	H	
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GAS to determine when gun clears defilade	H	
Announce DRIVER STOP	H	
Look through GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	H	
Lay on center mass of target	H	
Track moving target	H	
Depress lase button(s)	H	
Evaluate range display	P	System does not provide false multiple returns. Range cues differ from real-world.
Check ready-to-fire and fault symbols	H	
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Announce CANNOT IDENTIFY or does not respond	<u>H</u>	
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
Announce IDENTIFY <DIFFERENT TARGET>	<u>H</u>	
----- <u>Option 4.4. Use TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2) with the following alternate switch settings:		THERMAL MODE switch is painted on in STBY position. Thermal mode is entered by placing FLTR/CLEAR/SHTR switch to SHTR.
• THERMAL MODE: ON	<u>N</u>	
• FLTR/CLEAR/SHTR: SHTR	<u>P</u>	No FLTR position.
• THERMAL MAGNIFICATION: 3 TO 10X	<u>H</u>	
• POLARITY SWITCH: WHITE or BLACK HOT, as desired	<u>H</u>	
• SENSITIVITY/CONTRAST/FOCUS for best image	<u>N</u>	SENSITIVITY, CONTRAST, and FOCUS controls painted on.

Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	No recoil. Sight picture is obscured.
Observe/announce strike of every round	<u>P</u>	Flash and smoke indicate hits. Somewhat difficult to observe impact location of misses.
----- <u>Option 5.1. Reengage</u>		
Announce REENGAGING	<u>H</u>	
Release/reengage palm switches	<u>H</u>	
----- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		
----- <u>Option 5.2. Standard adjustment</u>		
Observe/announce deflection and range error	<u>H</u>	
Release/reengage palm switches	<u>H</u>	
Adjust 1 mil deflection	<u>H</u>	
Adjust 1 mil (GPS)/ Adjust 200 meters range (GAS)	<u>H</u>	
----- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 5.3. TC adjustment</u>		
Release/reengage palm switches	H	
Apply TC correction	H	
- - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - -		

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX

Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	No manual mode; emergency and normal modes only.
• LRF ARM: ARM LST RTN	H	Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.
• GPS: 3X	H	
• GUN SELECT: COAX	H	
Grasp palm switches	H	
Announced IDENTIFIED	H	
Switch GPS to 10X	H	
Lay center of target	H	
Depress lase button(s)	H	
Evaluate range display	P	System does not provide false multiple returns. Range cues differ from real-world.
Listen for FIRE	H	
Announce ON THE WAY	H	
Fire 20-30 rounds (5-6 tracers) to destroy/suppress point/area targets	P	Only area targets are represented.
Adjust fire as needed	H	

Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN

Engage first target using precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
If first target is not destroyed, adjust fire as described in Activity 5		See comments listed under Activity 5.
Engage second target using precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.

Activity 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS MAIN GUN ENGAGEMENTS)

GUARD FIST I does not simulate the cal .50, and therefore does not support simultaneous engagements.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>H</u>	<u>No manual mode; emergency and normal modes only.</u>
• LRF: SAFE	<u>H</u>	
• GPS: 3X	<u>H</u>	
• GUN SELECT: MAIN	<u>H</u>	
• AMMO SELECT: battlecarry ammo	<u>H</u>	
Engage target using precision gunnery (Option 4.1 or 4.2 but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>

<u>Option 9.2. Engage target given ineffective LRF</u>		
<u>Case 9.2.A. Use battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1)	<u>H</u>	<u>See comments listed under Option 9.1.</u>
<u>Case 9.2.B. TC indexes range</u>		
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Announce IDENTIFIED	<u>H</u>	
<u>Case 9.2.C. GNR indexes range</u>		
GUARD FIST I does not support.		
<u>Case 9.2.D. GNR manually applies range</u>		
Engage target using GAS (Option 9.10)		<u>See comments listed under Option 9.10.</u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.3. Engage target given multiple returns from LRF</u>		
<u>Note:</u> While the actions listed for Option 9.3, Cases 9.3.A. and 9.3.B. can be performed in their entirety, GUARD FIST I only minimally supports training of the Option for the following reasons: (1) it does not appear to give false multiple returns and (2) switching between ARM 1ST RTN and ARM LAST RTN does not appear to have an effect on the LRF range displayed.		
Depress lase button(s)	<u>M</u>	<u>Can be performed, see Note above.</u>
If multiple return symbol appears in GPS, announce RANGE <IN METERS>	<u>M</u>	<u>Can be performed, see Note above.</u>
Switch LRF setting in accordance with TC instructions	<u>M</u>	<u>Can be performed, see Note above.</u>
<u>Case 9.3.A. Gunner releases</u>		
Relay on target	<u>M</u>	<u>Can be performed, see Note above.</u>
Depress lase button(s)	<u>M</u>	<u>Can be performed, see Note above.</u>
<u>Case 9.3.B. TC corrects range</u>		
Squeeze trigger(s) with reticle on target	<u>M</u>	<u>Can be performed, see Note above.</u>

<u>Option 9.4. Engage target given no range display (loss of symbology)</u>		
<u>Case 9.4.A. Little or no time</u>		
Engage target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<u>Case 9.4.B. Time permitting</u>		
Open CCP door	<u>N</u>	<u>CCP is not operational since it is not connected to the power supply.</u>
Press RANGE button	<u>N</u>	<u>CCP is not operational since it is not connected to the power supply.</u>
Announce range	<u>N</u>	<u>CCP is not operational since it is not connected to the power supply.</u>

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
GUARD FIST I does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
GUARD FIST I does not simulate cant sensor failure.		

<u>Option 9.7. Lead angle sensor failure</u>		
GUARD FIST I does not simulate lead angle sensor failure.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
GUARD FIST I does not simulate GPS failure by itself; it does simulate GPS/TIS failure.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
<u>Case 9.9.A. Use GAS with precision techniques</u>		
Engage targets using GAS gunnery (Option 9.2)	_____	<u>See comments listed under Option 9.2.</u>
<u>Case 9.9.B. Use GAS with battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1) but with GAS instead of GPS	_____	<u>See comments listed under Option 9.1.</u>

<u>Option 9.10. Engage target using GAS</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>H</u>	<u>No manual mode; emergency and normal modes only.</u>
• LRF: SAFE	<u>H</u>	_____
• GUN SELECT: MAIN	<u>H</u>	_____
• AMMO SELECT: as announced	<u>H</u>	_____
• RETICLE select: announced ammo	<u>H</u>	_____
Sight through GAS	<u>H</u>	_____
Grasp palm switches	<u>H</u>	_____
Announce IDENTIFIED	<u>H</u>	_____
Lay announced range line on target	<u>H</u>	_____
Begin tracking moving target	<u>H</u>	_____
Apply lead to moving target	<u>H</u>	_____
Listen for FIRE	<u>H</u>	_____
Announce ON THE WAY	<u>H</u>	_____
Squeeze trigger(s) with reticle aiming point on target	<u>H</u>	_____
Continue tracking	<u>H</u>	_____

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.11. Engage target given stabilization system failure (emergency mode)</u>		
Set/check switches:		
• FIRE CONTROL MODE: EMERGENCY	<u>H</u>	<u>No manual mode; emergency and normal modes only.</u>
• LRF: ARM LST RTN	<u>H</u>	<u>Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.</u>
• GPS: 3X	<u>H</u>	
• GUN SELECT: MAIN	<u>H</u>	
• AMMO SELECT: as announced	<u>H</u>	
Sight through GAS	<u>H</u>	
Grasp palm switches	<u>H</u>	
Announce IDENTIFIED	<u>H</u>	
Begin tracking moving target	<u>H</u>	
Apply lead to moving target	<u>H</u>	
Listen for FIRE	<u>H</u>	
Announce ON THE WAY	<u>H</u>	
Squeeze trigger(s) with reticle aiming point on target	<u>H</u>	
Continue tracking	<u>H</u>	

Option 9.12. Engage target given
turret power failure

GUARD FIST I does not simulate turret power failure.

**Activity 10. ENGAGE TARGET FROM
THE TC POSITION**

Case 10.A. Gunner cannot identify
target

Set/check switches:		
• FIRE CONTROL MODE: NORMAL	<u>H</u>	<u>No manual mode; emergency and normal modes only.</u>
• TIS: STBY/ON	<u>P</u>	<u>THERMAL MODE switch is painted on in STDBY position.</u>
• LRF: ARM LAST RTN	<u>H</u>	<u>Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.</u>
• GPS: 10X	<u>H</u>	
• GUN SELECT: MAIN	<u>H</u>	
• AMMO SELECT: as announced	<u>H</u>	

Case 10.B. Three-man crew

No gunner's actions specified.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check/adjust MRS	<u>N</u>	<u>MRS lever is not operational.</u>
<u>Case 11.A. Stationary</u>		
No gunner's actions specified		
<u>Case 11.B. Moving</u>		
Index battlecarry ammo	<u>H</u>	
Announce <AMMO> INDEXED	<u>H</u>	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
GUARD FIST I does not simulate or provide for use of Loader's M240 machinegun. No gunner actions specified.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
GUARD FIST I does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
GUARD FIST I does not simulate smoke grenade launcher.		

<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
GUARD FIST I does not simulate vehicle exhaust smoke. No gunner's actions specified.		
Activity 15. SUBMIT REPORTS		
No gunner's actions specified.		

ASSESSMENT OF TANK COMMANDER ACTIVITIES ON GUARD FIST I

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
<u>Note:</u> GUARD FIST I does not have a specific exercise devoted to performing preops. However, a number of the preops actions can be performed before beginning the engagement exercises.		
Enter station	<u>H</u>	
Power up CWS/turret	<u>N</u>	The CWS and turret are not operational since they are not connected to the power supply.
Operate domelight	<u>H</u>	
Operate intercom	<u>H</u>	
Adjust seat	<u>H</u>	
Adjust hatch	<u>N</u>	For safety reasons hatches remain open.
Adjust platform	<u>H</u>	
Install TC's weapon	<u>N</u>	
Adjust kneeguard	<u>H</u>	
Adjust GPSE headrest/lens	<u>H</u>	
Check manual range controls	<u>H</u>	
Check power control handle	<u>N</u>	Can only be checked within the context of an exercise.
Check CWS in power/manual modes	<u>N</u>	Can only be checked within the context of an exercise.
Activity 2. PERFORM PREPARE- TO-FIRE CHECKS		
Supervise/assist boresight	<u>N</u>	No main gun boresight scenarios.
Boresight TC's weapon	<u>N</u>	No cal .50 boresight scenarios.
Zero TC's weapon	<u>N</u>	No zeroing scenarios.
Select/announce battlecarry AMMO, RANGE	<u>H</u>	
<u>Option 2.1. Prepare for offense</u>		
Receive offensive mission/ formation/movement/commo	<u>M</u>	May receive some commo from I/O acting as platoon leader. No mission scenarios per se to be briefed on.
Analyze terrain	<u>N</u>	No maps or time to analyze terrain.
Check map overlay	<u>N</u>	No maps of simulated terrain.
Brief crew	<u>M</u>	TC can brief crew, although there is little time to do so and not much information to pass on.
Control driver, if necessary to maintain position in platoon formation and to exploit cover and concealment	<u>M</u>	TC can give driver commands, however, own tank operates alone, there are no other friendly vehicles in the simulation.

	RATING	COMMENTS
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS (continued)		
<u>Option 2.2. Prepare for defense</u>		
Issue driver commands to move with platoon to occupy battle position	N	Defensive exercises are conducted for a battle position, own tank can move only between turret and hull defilade.
Receive defensive mission/position commo		No mission scenarios per se.
Prepare primary/alternate/supplementary positions	N	May receive some commo from I/O acting as platoon leader. Cannot prepare positions.
Analyze terrain	N	No maps or time to analyze terrain.
Prepare tank sketch card	N	No time to prepare sketch card.

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search for Target(s)**Option 3.1.1. Search open hatch - day

GUARD FIST I does not simulate open hatch viewing, although for safety reasons the hatches remain open.

Option 3.1.2. Search closed hatch - day

Note: For safety reasons the hatch remains open. The exercises simulate closed hatch engagements.

Search 360°	P	Can search 360° by rotating CWS.
Perform air guard duties	N	No aircraft targets.
Execute search techniques	H	

Option 3.1.3. Search at night

Search 360°	P	Can search 360° by rotating CWS.
Use off-center vision	N	Applies mainly to night open hatch viewing and open hatch viewing is not simulated.

	RATING	COMMENTS
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.2. Detect/Locate/Identify Target(s)		
Detect target(s)/signature(s)/obstacle(s)	M	No target signatures (smoke, flash, dust); targets do not fire. No obstacles.
Locate target(s)	H	
Identify target(s) by:		
• IFFN	N	All targets are threat.
• Nomenclature	P	Limited threat target array.
Note number of target	H	
Classify multiple targets as most dangerous/dangerous/least dangerous	H	Owntank is automatically killed if least dangerous target is engaged first.
Confirm acquisition report	H	
Estimate range to select weapon(s) and to evaluate LRF return	M	Range cues provided by computer generated image (CGI) are substantially different from real-world.
Send contact report to platoon leader	P	Instructor/Operator (I/O) must "play" platoon leader.

Part 3.3. Evaluate Situation		
Decide whether or not to engage contingent on:	N	Owntank operates alone, there are no platoon exercises.
• Platoon mission		
• Platoon fire plan		
• Platoon leader command		
Select the appropriate weapon/ammunition and the firing mode (precision/degraded) contingent on:	P	Loader's and TC's machineguns not simulated. TC can make decision, only difference is that TC knows the tank status from the exercise, not from conducting a self test.
• Target range		
• Type of target (hard/soft, point/area)		
• Tank status (ammo, malfunctions)		
Determine crewman (GMR, TC, LDR) and the type of fire command (single, multiple, or simultaneous) contingent on:	M	No TC cal .50 engagements. No Loader's M240 machinegun engagements. No simultaneous target engagements.
• Number of targets		
• Target classification		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Decide whether to engage target while moving or from a short halt	H	
If engaging from a short halt, Issue driver command: DRIVER STOP	H	
Relay any action drill command	N	Owntank operates alone, not in platoon context.
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	
Announce FIRE, or FIRE, FIRE <ALTERNATE AMMO>	H	

<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Announce DRIVER MOVE OUT, GUNNER TAKE OVER	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	
Announce FIRE, or FIRE, FIRE <ALTERNATE AMMO>	H	

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Direct gunner onto target using one of the following techniques:		
• Verbal command: TRAVERSE <LEFT or RIGHT>, STEADY, ON	H	
• TRPs	P	No time to prepare TRPs. Lack of distinguishing terrain features.
• Announce WATCH MY TRACERS and use .50 caliber tracers to point to target	N	Cal .50 is not represented.
or		
Announce FROM MY POSITION and proceed with TC engagement (see Activity 10)	H	
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
If GNR is correct, issue a correction to the fire command	H	
If GNR identifies the wrong target, treat as Case 4.3.A. and proceed		See comments listed under Activity 4, Case 4.3.A.
<u>Option 4.4. Engage target using TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2)		See comments listed under Options 4.1 and 4.2.
Activity 5. ADJUST FIRE		
Recover sight picture	M	No recoil. Sight picture is obscured.
Observe strike of round	P	Flash and smoke indicate hits. Somewhat difficult to observe impact location of misses.
If TARGET was observed, determine whether or not target was destroyed	N	Targets are scored either hit or miss; there are no mobility kills.
<u>Option 5.1. Use reengage technique</u>		
Evaluate range	P	CGI range cues differ substantially from real-world.
Announce FIRE	H	
<u>Option 5.2. Use standard adjustment</u>		
No TC actions specified.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE (continued)		
<u>Option 5.3. Use TC adjustment</u>		
Issue subsequent fire command to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	<u>H</u>	
If target is destroyed or exposure too long, command CEASE FIRE	<u>H</u>	
If in defensive posture, command DRIVER, BACK UP	<u>H</u>	
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Issue fire command: GUNNER COAX <TARGET>	<u>H</u>	
Lay gun (simultaneous with fire command)	<u>H</u>	
Release override	<u>H</u>	
Evaluate range display	<u>P</u>	<u>CGI range cues differ substantially from real-world.</u>
Announce FIRE	<u>H</u>	
Monitor/evaluate engagement	<u>H</u>	
Command CEASE FIRE	<u>H</u>	
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Issue fire command: GUNNER <AMMO> <NUMBER> <TARGETS>, <RIGHT/LEFT> <TARGET> FIRST	<u>H</u>	
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, adjust fire (Activity 5)		<u>See comments listed under Activity 5.</u>
If first target is destroyed, announce <NEXT> TARGET	<u>H</u>	
[Continue until all targets are destroyed]		
Announce CEASE FIRE	<u>H</u>	
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
<u>Option 8.1. Simultaneous targets</u>		
GUARD FIST I does not simulate the cal .50 and therefore does not support simultaneous engagements.		

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Issue fire command: GUNNER BATTLESIGHT <TARGET>	H	
Depress MANUAL RANGE BATTLE SGT button	H	
Estimate range to target	M	CGI range cues differ substantially from real-world.
If target outside of +/- 200 meters of battlesight range, enter range change using MAN RNG B/S ADD DROP toggle switch	H	
Check range readout in GPSE	H	
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> evaluating LRF display		See comments listed under Activity 4, Options 4.1 and 4.2.

<u>Options 9.2. Engage targets given ineffective LRF</u>		
If LRF fails to function or is rendered ineffective due to environmental conditions or battlefield obscurants, TC chooses using one of the following techniques:		
<u>Case 9.2.A. Use battlesight gunnery</u>		
Engage target using battlesight gunnery (Option 9.1)		See comments listed under Option 9.1.
<u>Case 9.2.B. TC indexes range</u>		
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Estimate range to target	M	CGI range cues differ substantially from real-world.
Index range using MAN RNG B/S ADD/DROP toggle switch	H	
<u>Case 9.2.C. GNR indexes range</u>		
GUARD FIST I does not support. Gunner cannot index range.		
<u>Case 9.2.D. GNR manually applies range</u>		
Engage target using GAS (Option 9.10)		See comments listed under Option 9.10.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.3. Engage targets given multiple returns from LRF</u>		
<u>Note:</u> While the actions listed for Option 9.3, Cases 9.3.A. and 9.3.B. can be performed in their entirety, GUARD FIST I only minimally supports training of the Option for the following reasons: (1) it does not appear to give false multiple returns and (2) switching between ARM 1ST RTN and ARM LAST RTN does not appear to have an effect on the LRF range displayed.		
Estimate range	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Evaluate range display	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
If range appears incorrect, may instruct GNR to switch LRF setting from ARM LAST RTN to ARM 1ST RTN or v.v.	<u>M</u>	<u>Can be performed, see note above.</u>
If multiple return symbol appears in GPSE and displayed range is outside ± 200 m of estimated range, take either one of the following actions:		
<u>Case 9.3.A. Gunner releases</u>		
Announce RELEASE	<u>M</u>	<u>Can be performed, see note above.</u>
<u>Case 9.3.B. TC corrects range</u>		
Correct range using MAN RNG B/S ADD/DROP toggle switch	<u>M</u>	<u>Can be performed, see note above.</u>
If displayed range is within ± 200 m of estimated range, announce FIRE	<u>M</u>	<u>CGI range cues differ substantially from real-world. Can be performed, see note above.</u>

<u>Option 9.4. Engage targets given no range display (loss of symbology)</u>		
<u>Case 9.4.A. Little or no time</u>		
Engage target using precision gunnery (Option 4.1 or 4.2) but without evaluating range		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<u>Case 9.4.B. Time permitting</u>		
Have gunner report range from CCP	<u>N</u>	<u>CCP is not operational since it is not connected to power source.</u>
Evaluate range	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
GUARD FIST I does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
GUARD FIST I does not simulate cant sensor failure.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.7. Engage target given lead angle sensor failure</u>		
GUARD FIST I does not simulate lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
GUARD FIST I does not simulate GPS failure by itself; it does simulate GPS/TIS failure.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
<u>Case 9.9.A. Use GAS with precision techniques</u>		
Engage target using GAS gunnery (Option 9.2)	_____	<u>See comments listed under Option 9.2.</u>
<u>Case 9.9.B. Use GAS with battlesight techniques</u>		
Engage target using battlesight gunnery (Option 9.1)	_____	<u>See comments listed under Option 9.1.</u>

<u>Option 9.10. Engage target using GAS gunnery</u>		
Estimate range to target	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Issue fire command: GUNNER <AMMO> <TARGET> <RANGE>	<u>H</u>	_____
Lay gun (simultaneous with fire command)	<u>H</u>	_____
Release override	<u>H</u>	_____
Announce FIRE	<u>H</u>	_____

<u>Option 9.11. Engage target given stabilization system failure (in emergency mode)</u>		
Issue fire command: GUNNER <AMMO> <TARGET>	<u>H</u>	_____
Announce DRIVER STOP	<u>H</u>	_____
Lay gun (simultaneous with fire command)	<u>H</u>	_____
Release override	<u>H</u>	_____
Announce FIRE	<u>H</u>	_____
Announce DRIVER, MOVE OUT	<u>H</u>	_____

<u>Option 9.12. Engage target given turret power failure</u>		
GUARD FIST I does not simulate turret power failure.		

	RATING	COMMENTS
Activity 10. ENGAGE TARGETS FROM THE TC POSITION		
(Also Three-Man Crew Engagements)		
Issue one of the following fire commands:		
<u>Case 10.A. Gunner cannot identify target</u>		
FROM MY POSITION	H	
or		
<u>Case 10.B. Three-man crew (no GNR)</u>		
LOAD <AMMO>	H	
Estimate range to target	M	CGI range cues differ substantially from real-world.
Sight through GPSE	H	
Lay on center mass of target	H	
Depress lase button	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Make control lay	H	
Announce ON THE WAY	H	
Squeeze trigger	H	
Announce CEASE FIRE	H	
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Assess battle damage/casualties	N	Battle damage/casualties are not represented.
Determine if and how crew should be reorganized to fight in a three-man configuration	N	Battle damage/casualties are not represented.
Issue SPOTREP	M	Limited amount of time; exercise may stop before SPOTREP can be issued. I/O must "play" platoon leader.
<u>Case 11.A. If tank is stationary</u>		
Determine whether to move to primary, alternate, or supplementary firing positions	N	No firing positions.
<u>Case 11.B. If tank is moving</u>		
Determine changes to route	H	
Issue driver commands	H	
Determine appropriate ammo for anticipated targets	H	
Announce PREPARE BATTLECARRY <AMMO> or RELOAD <AMMO>	H	
Enter battlecarry range using the MANUAL BATTLE SGT ADD/DROP toggle switch	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
GUARD FIST I does not simulate or provide for use of Loader's M240 machinegun.		
Activity 13. IMMEDIATE ACTION- MISFIRE		
GUARD FIST I does not simulate main gun misfire. Manual controls are not operational.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 smoke grenade launcher</u>		
GUARD FIST I does not simulate smoke grenade launcher.		

<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
GUARD FIST I does not simulate vehicle exhaust smoke.		
Activity 15. SUBMIT REPORTS		
Operate radio	<u>P</u>	<u>I/O must "play" platoon leader.</u>

ASSESSMENT OF LOADER ACTIVITIES ON GUARD FIST I

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
<u>Note:</u> GUARD FIST I does not have a specific exercise devoted to performing preops. However, a number of the preops actions can be performed before beginning the engagement exercises.		
Erect crosswind sensor	<u>N</u>	<u>Crosswind sensor not installed.</u>
Install LDR's machinegun	<u>N</u>	<u>Loader's M240 machinegun not installed.</u>
Enter LDR's station	<u>H</u>	<u></u>
Operate domelight	<u>H</u>	<u></u>
Power up LDR's station	<u>N</u>	<u>Necessary controls are represented but are not operational since they are not connected to power supply.</u>
Operate intercom	<u>H</u>	<u></u>
Adjust LDR's seat/platform	<u>H</u>	<u></u>
Adjust LDR's hatch	<u>N</u>	<u>For safety reasons hatches remain open.</u>
Install/check LDR's night vision viewer	<u>N</u>	<u>Viewer cannot be installed, hatch is open.</u>
Position LDR's guards for firing	<u>H</u>	<u></u>
Operate LDR's panel	<u>N</u>	<u>Controls are represented but are not operational since they are not connected to power supply.</u>
Operate turret traverse lock	<u>N</u>	<u>Turret traverse lock must stay in locked position.</u>
Operate ready ammunition door in auto/manual modes	<u>M</u>	<u>Cannot open ammo doors manually. Auto mode (knee switch) is simulated.</u>
Operate semi-ready ammunition door	<u>N</u>	<u>Cannot operate semi-ready ammo door.</u>
Operate hull ammunition door	<u>N</u>	<u>Cannot operate hull ammo door.</u>
Stow 105mm ammunition	<u>N</u>	<u>Cannot stow ammo.</u>
Operate main gun breechblock	<u>N</u>	<u>Cannot operate main gun breechblock.</u>
Check replenisher	<u>H</u>	<u></u>

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Clear/load coaxial machinegun	<u>N</u>	<u>Coax not installed.</u>
Fill ready rack	<u>N</u>	<u>Cannot place ammo in ready rack.</u>
Report ammo status	<u>M</u>	<u>Can be performed, but unnecessary.</u>
		Ammo is loaded by activating the knee switch and then pressing either the SABOT or HEAT button located on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door. Next, after a specific time interval, used to simulate the time it takes to remove a round from the ready rack and place it in the main gun breech, a READY indicator light on the BREECH LOAD SELECT PANEL which is mounted on the rear of the breechblock is illuminated. After the READY light goes on the loader can then press the LOAD button on the BREECH LOAD SELECT PANEL to simulate the loading of the round. An indicator light located on the BREECH LOAD SELECT PANEL, labeled LOADED, goes on to indicate that a simulated round is ready to be fired.
Load battlecarry ammo	<u>M</u>	
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>N</u>	<u>No mission scenarios per se.</u>
<u>Option 2.2. Prepare for defense</u>		
Inspect terrain to flank/rear	<u>N</u>	<u>No loader vision blocks.</u>

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search for Target(s)**

GUARD FIST I does not provide loader's vision blocks, therefore the loader is not able to search, detect, or acquire targets.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Drop down into turret	N	Loader is already in turret.
Check turret ring	N	Turret does not move.
Set GUN/TURRET DRIVE switch in EL UNCPL position	H	
<u>Case 4.1.A. Announced round is not loaded</u>		
Move ejection guard to SAFE	H	
Ensure SAFE light is lit	H	
Open breech	M	Simulated by pressing the LOAD button on the BREECH LOAD SELECT PANEL mounted on the rear of the breechblock.
Remove incorrect round from chamber, if necessary	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Open ammo doors	H	
Stow unwanted round, if necessary	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Remove correct round from stowage	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Load desired round	M	Simulated by pressing the LOAD button on the BREECH LOAD SELECT PANEL mounted on the rear of the breechblock.
[Continue with Case 4.1.B]		
<u>Case 4.1.B. Announced round loaded</u>		
Move ejection guard to FIRE	H	
Clear recoil path	M	No recoil.
Announce UP	H	
Open ammo doors	H	

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)	RATING	COMMENTS
<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Drop down into turret	N	Loader is already in turret.
Check turret ring	N	Turret does not move.
Set GUN/TURRET DRIVE switch in POWERED position	H	
<u>Case 4.2.A. Announced round is not loaded</u>		
Move ejection guard to SAFE	H	
Ensure MAIN GUN STATUS light is lit	H	
Open breech	M	Simulated by pressing the LOAD button on the BREECH LOAD SELECT PANEL mounted on the rear of the breechblock.
Remove incorrect round from chamber, if necessary	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Open ammo doors	H	
Stow unwanted round, if necessary	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Remove correct round from stowage	M	Simulated by pressing either SABOT or HEAT buttons on the AMMUNITION SELECT PANEL which is mounted on the ready ammo door.
Load desired round	M	Simulated by pressing the LOAD button on the BREECH LOAD SELECT PANEL mounted on the rear of the breechblock.
[Continue with Case 4.2.B]		
<u>Case 4.2.B. Announced round loaded</u>		
Move ejection guard to FIRE	H	
Clear recoil path	M	No recoil.
Announce UP	H	
Open ammo doors	H	
<u>Option 4.3. Gunner cannot identify announced target</u>		
No LDR actions specified.		
<u>Option 4.4. Engage targets using TIS</u>		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Options 4.1 and 4.2.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE		
Set GUN/TURRET drive switch in EL UNCPL position	<u>H</u>	
Load announced round (Case A, Option 4.1)		<u>See comments listed under Activity 4, Option 4.1, Case 4.1.A</u>
Move ejection guard to FIRE	<u>H</u>	
Clear recoil path	<u>M</u>	<u>No recoil.</u>
Announce UP	<u>H</u>	
<hr/>		
<u>Option 5.1. Use reengage technique</u>		
No LDR actions specified		
<hr/>		
<u>Option 5.2. Use standard adjustment</u>		
No LDR actions specified		
<hr/>		
<u>Option 5.3. Use TC adjustment</u>		
No LDR actions specified		
<hr/>		
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Set GUN/TURRET drive switch on POWERED	<u>H</u>	
Monitor and correct ammo feed	<u>N</u>	<u>Procedure not simulated.</u>
<hr/>		
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, perform LDR's actions as described in Activity 5		<u>See comments listed under Activity 5.</u>
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<hr/>		
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
GUARD FIST I does not simulate the cal .50 and therefore does not support simultaneous engagements.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Options 9.1 - 9.12</u>		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	_____	<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)	_____	<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check replenisher reservoir	<u>M</u>	<u>Fluid level in replenisher will not change.</u>
Remove spent casings	<u>N</u>	<u>Spent casings not simulated.</u>
Load announced round as described in precision gunnery (Option 4.1 or 4.2)	_____	<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Announce loading status	<u>H</u>	_____
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
GUARD FIST I does not simulate or provide for use of Loader's M240 machinegun.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
GUARD FIST I does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
GUARD FIST I does not simulate smoke grenade launcher.		
<u>Option 14.2. Use vehicle engine smoke exhaust system</u>		
GUARD FIST I does not simulate vehicle exhaust smoke.		
Activity 15. SUBMIT REPORTS		
No loader's actions specified.		

ASSESSMENT OF DRIVER ACTIVITIES ON GUARD FIST I

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
<u>Note:</u> GUARD FIST I does not have a specific exercise devoted to performing preops. However, a number of the preops actions can be performed before beginning the engagement exercises.		
Enter DVR's station	<u>H</u>	
Power up hull systems	<u>N</u>	Necessary controls are not operational since they are not connected to power supply.
Operate domelight	<u>H</u>	
Check turret seal	<u>N</u>	Cannot check turret seal; no power.
Operate intercom	<u>H</u>	
Adjust seat/periscopes	<u>M</u>	Can adjust seat for open hatch position. No periscopes.
Adjust hatch	<u>H</u>	
Adjust steer/throttle control	<u>H</u>	
Operate drain valves	<u>H</u>	
Start engine	<u>N</u>	Cannot start engine.
Make after-start checks	<u>N</u>	Cannot start engine.
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Check fuel tanks	<u>N</u>	Fuel gages do not operate; no power.
Report fuel status	<u>N</u>	Fuel gages do not operate; no power.
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>M</u>	Little time. No mission scenario per se.
Select routes in accordance with mission and formation	<u>N</u>	No maps of simulated terrain. Owntank operates alone, there are no other friendly vehicles in the simulation.
<u>Option 2.2. Prepare for defense</u>		
Drive to battle position	<u>N</u>	Defensive exercises are conducted from a battle position, owntank can move only between turret and hull defilade positions.
Rehearse movement between primary and alternate firing positions	<u>N</u>	Defensive exercises are conducted from a battle position, owntank can move only between turret and hull defilade positions.
Take primary firing positions	<u>N</u>	Defensive exercises are conducted from a battle position, owntank can move only between turret and hull defilade positions.
Monitor displays	<u>N</u>	Gages and controls are not operational; no power.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search for Target(s)		
<u>Option 3.1.1. Search open hatch - day</u>		
GUARD FIST I does not simulate open hatch viewing.		

<u>Option 3.1.2. Search closed hatch - day</u>		
If moving, follow wingman concept/ react to formation changes	<u>N</u>	Owntank operates alone, there are no friendly vehicles in the simulation.
Search fender to fender	<u>P</u>	Driver views a computer generated image (CGI) on a monitor placed in front of him.
Execute search techniques	<u>H</u>	

<u>Option 3.1.3. Search at night</u>		
VVS-2 (night vision device)	<u>N</u>	Night vision device cannot be installed.

Part 3.2. Detect/Locate/ Identify Target(s)		
Detect target(s)/signature(s)/ obstacle(s)	<u>P</u>	No target signatures (flash, smoke, bang, dust); targets do not fire. No obstacles.
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		
• IFFN	<u>N</u>	All targets are threat.
• Nomenclature	<u>P</u>	Limited threat target array.
If target detected, announce DRIVER REPORT, <TARGET>, <LOCATION>	<u>H</u>	
Evaluate cover and concealment	<u>N</u>	Cover and concealment not provided.

Part 3.3. Evaluate Situation		
Search fender to fender using VVS-2 (night vision device)	<u>N</u>	Night vision device cannot be installed.

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Monitor TC and platoon leader commands	P	I/O must "play" platoon leader.
If TC announces HALT, stop smoothly	H	
If TC does not announce HALT, maintain steady platform	P	Difficult to maintain steady speed and platform.
If antitank fire is encountered, seek cover and concealment or execute action drill	N	Anti-tank fire is not simulated.
Alert crew of obstacles	N	Obstacles are not simulated.

<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Set TACTICAL IDLE switch to ON position	N	TACTICAL IDLE switch not operational.
Set transmission control to D	H	
Release parking brake	N	Parking brake is not operational.
Depress service brake	H	
Move to hull defilade position	H	
Set transmission control to R	H	
Depress/hold service brake	H	

<u>Option 4.3. Gunner cannot identify announced target</u>		
No driver actions specified.		

<u>Option 4.4. Engage target using TIS</u>		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)	H	See comments listed under Option 4.1.

	RATING	COMMENTS
Activity 5. ADJUST FIRE		
Return to defilade or seek alternate position	M	In offensive exercises there are no prepared positions. In defensive exercises tank can only move between turret and hull defilade positions.
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
Maintain steady platform	P	Difficult to maintain steady speed and platform.
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
If first target is not destroyed, perform DVR's actions as described in fire adjustment (Activity 5)		See comments listed under Activity 5.
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
Activity 9. ENGAGE TARGET USING DEGRADED GUNNERY TECHNIQUES		
<u>Options 9.1 - 9.10</u>		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
<u>Option 9.11 - 9.12. Engage target given stabilization system/turret power failure</u>		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		See comments listed under Activity 4, Options 4.1 and 4.2.
Stop smoothly	H	
Resume driving	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Respond to TC driving commands	<u>H</u>	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
GUARD FIST I does not simulate or provide for use of Loader's M240 machinegun.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
GUARD FIST I does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE ENGAGEMENT		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
GUARD FIST I does not simulate smoke grenade launcher.		
<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
GUARD FIST I does not simulate vehicle exhaust smoke.		
Activity 15. SUBMIT REPORTS		
No driver's actions specified.		

ASSESSMENT OF GUNNER ACTIVITIES ON SIMNET

	RATING	COMMENTS
Activity 1. PREPARE STATIONS FOR OPERATION		
Enter gunner station	M	Enter SIMNET through door at side of crew compartment.
Operate domelight	P	Domelight does not go completely off. No red filter on domelight.
Operate intercom	P	Headset/boom mike are used to simulate CVC helmet. Rocker switch on cable replaces 3-position switch on helmet.
Install coax	N	Coax is not represented.
Adjust seats	N	Gunner's seat does not adjust.
Adjust browpads	N	GPS "browpads" do not adjust.
Adjust chestrest	N	Gunner's chestrest is not represented.
Power up GNR station	M	PANEL LIGHTS TEST button and adjust knob are painted on. CCP is not represented; door is painted on. All thermal controls are painted on with the THERMAL MODE switch painted in the OFF position. Hydraulic pressure gage, and main gun travel and traverse turret locks are not represented. The MANUAL indicator light of the FIRE CONTROL MODE switch is painted on.
Perform GPS function check	P	DEFROSTER switch and indicator light are not represented. GPS ballistic doors are not represented. FLTR/CLEAR/SHTR switch is painted on in the CLEAR position. The MANUAL indicator light of the FIRE CONTROL switch, the COAX indicator light of the GUN SELECT switch, and the BP and HEP indicator lights of the AMMUNITION SELECT switch are painted on.
Adjust GPS	N	GPS cannot be focused. Reticle drift knobs painted on, do not function.
Perform computer self-test	N	CCP is not represented; door is painted on.
Perform computer data check	N	CCP is not represented; door is painted on.
Perform TIS check	N	TIS does not function; controls are painted on.
Perform GAS adjust	N	GAS is not represented.
Check power control handles	P	LRF will fire without depressing palm grips. Gun tube does not automatically elevate over rear deck.
Check manual elevation/traverse cranks	N	Manual elevation and traverse cranks are not represented.
Perform lead system check	N	No apparent reticle movement as a function of turret traversal.
Perform firing circuit check	N	No firing circuit tester.
Perform crosswind sensor check	N	Crosswind sensor is not represented.
Perform hydraulic pressure check	N	Hydraulic pressure gage not represented.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Boresight main gun	<u>N</u>	<u>Cannot boresight main gun; assumed boresighted.</u>
Zero coax	<u>N</u>	<u>Coax is not represented.</u>
Report weapon status	<u>M</u>	<u>Can be performed, although most preceding actions cannot be performed.</u>
Index battlecarry ammo on AMMO SEL switch	<u>H</u>	
Introduce battlesight range into CCP	<u>N</u>	<u>CCP is not represented; door is painted on.</u>
<hr/>		
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>H</u>	
<hr/>		
<u>Option 2.2. Prepare for defense</u>		
Inspect terrain through GPS/TIS	<u>M</u>	<u>TIS is not simulated.</u>
Check GAS clearance	<u>N</u>	<u>GAS is not represented.</u>
Learn TRP locations/ranges	<u>H</u>	

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search**Option 3.1.1. Open hatch - day

SIMNET does not simulate open hatch viewing.

Option 3.1.2. Closed hatch - day

Select 3X GPS/TIS magnification	<u>P</u>	<u>Shape and detail of objects change as a function of magnification.</u>
Search on gun axis using GPS	<u>H</u>	
Alternate using GPS with TIS	<u>N</u>	<u>TIS is not simulated.</u>
Execute search techniques to acquire targets	<u>H</u>	

Option 3.1.3. Night

SIMNET does not simulate night viewing conditions.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S)		
Part 3.2. Detection/Location/Identify Target(s)		
Detect target(s)/signature(s)/obstacles	<u>P</u>	<u>Only target signatures are dust and smoke from vehicles.</u>
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		
• IFFN	<u>P</u>	<u>Easier to perform than in real-world; color distinguishes friendly (brown) from threat (green).</u>
• Nomenclature	<u>P</u>	<u>Easier to perform than in real-world due to limited threat target array.</u>
If target detected, announce GUNNER REPORT, <TARGET>, <LOCATION>	<u>H</u>	
Confirm acquisition report	<u>H</u>	
Estimate range to evaluate LRF return	<u>M</u>	<u>Computer Generated Image (CGI) range cues differ substantially from real-world.</u>

Part 3.3. Evaluate Situation		
No gunner actions specified.		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Precision engagement - moving (offense)</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: ARM LAST RTN	H	Placement of RANGE switch (ARM LAST RTN or ARM 1ST RTN) does not appear to effect LRF range display.
• GPS: 3X	H	
• GUN SELECT: MAIN	H	
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look throughn GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	P	Shape and detail of objects change as a function of magnification.
Lay on center mass of target	H	
Track moving target	P	No simulation of lead angle sensor system; can lead to tendency to ambush targets.
Listen for driver alerts	H	
Depress lase button(s)	P	LRF will fire without depressing palm grips.
Evaluate range display	P	CGI range cues differ substantially from real-world.
Check ready-to-fire and fault symbols	P	LRF faults and fault symbol are not simulated.
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Precision engagement - defense</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: ARM LAST RTN	H	
• GPS: 3X	H	
• GUN SELECT: MAIN	H	
• AMMO SELECT: as announced	H	
Sight through GPS	H	
Grasp palm switches	H	
Look through GAS to determine when gun clears defilade	N	<u>GAS is not represented.</u>
Announce DRIVER STOP	H	
Look through GPS	H	
Announce IDENTIFIED	H	
Switch GPS to 10X	P	<u>Shape and detail of objects change as a function of magnification.</u>
Lay on center mass of target	H	
Track moving target	P	<u>No simulation of lead angle sensor system, can lead to tendency to ambush targets.</u>
Depress lase button(s)	P	<u>LRF will fire without depressing palm grips.</u>
Evaluate range display	P	<u>CGI range cues differ substantially from real-world.</u>
Check ready-to-fire and fault symbols	P	<u>LRF faults and fault symbol are not simulated.</u>
Make control lay	H	
Listen for UP	H	
Listen for FIRE	H	
Announce ON THE WAY	H	
Squeeze trigger(s)	H	
Continue tracking	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Announce CANNOT IDENTIFY or does not respond	<u>H</u>	
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
Announce IDENTIFY <DIFFERENT TARGET>	<u>H</u>	

<u>Option 4.4. Use TIS</u>		
SIMNET does not simulate thermal optics viewing conditions.		

Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	<u>Recoil is not simulated.</u>
Observe/announce strike of every round	<u>P</u>	<u>Round impacts cartoonish, somewhat difficult to observe.</u>

<u>Option 5.1. Reengage</u>		
Announce REENGAGING	<u>H</u>	
Release/reengage palm switches	<u>P</u>	<u>Lead angle sensor system is not simulated; releasing/ reengaging has no effect.</u>
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

<u>Option 5.2. Standard adjustment</u>		
Observe/announce deflection and range error	<u>H</u>	
Release/reengage palm switches	<u>P</u>	<u>Lead angle sensor system is not simulated; releasing/ reengaging has no effect.</u>
Adjust 1 mil deflection	<u>H</u>	
Adjust 1 mil (GPS)/ Adjust 200 meters range (GAS)	<u>M</u>	<u>GAS not represented.</u>
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

<u>Option 5.3. TC adjustment</u>		
Release/reengage palm switches	<u>P</u>	<u>Lead angle sensor system is not simulated; releasing/ reengaging has no effect.</u>
Apply TC correction	<u>H</u>	
- - - - - REMAINDER OF ENGAGEMENT SAME AS PRECISION (Option 4.1 or 4.2) - - - - -		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
SIMNET does not simulate the coaxial machinegun.		
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, adjust fire as described in Activity 5		<u>See comments listed under Activity 5.</u>
Engage second target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 8. ENGAGE TARGETS WITH THE CAL .50 (INCLUDING SIMULTANEOUS MAIN GUN ENGAGEMENTS)		
SIMNET does not simulate the cal .50 and therefore does not support simultaneous engagements.		
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Set/check switches:		
• FIRE CONTROL MODE: NORMAL	H	
• LRF: SAFE	H	
• GPS: 3X	H	
• GUN SELECT: MAIN	H	
• AMMO SELECT: battlecarry ammo	P	Regardless of AMMUNITION SELECT switch position, the BS range is 1200 meters.
Engage target using precision gunnery (Option 4.1 or 4.2 but <u>without</u> lasing to target		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<u>Option 9.2. Engage target given ineffective LRF</u>		
SIMNET does not simulate ineffective LRF.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.3. Engage target given multiple returns from LRF</u>		
<u>Note:</u> While the actions listed for Option 9.3, Cases 9.3.A. and 9.3.B. can be performed in the entirety, SIMNET only minimally supports training of the Option for the following reasons: (1) it does not appear to give false multiple returns and (2) switching between ARM 1ST RTN and ARM LAST RTN does not appear to have an effect on the LRF range displayed.		
Depress lase button(s)	<u>M</u>	<u>Can be performed, see Note above.</u>
If multiple return symbol appears in GPS, announce RANGE <IN METERS>	<u>M</u>	<u>Can be performed, see Note above.</u>
Switch LRF setting in accordance with TC instructions	<u>M</u>	<u>Can be performed, see Note above.</u>
<u>Case 9.3.A. Gunner releases</u>		
Relay on target	<u>M</u>	<u>Can be performed, see Note above.</u>
Depress lase button(s)	<u>M</u>	<u>Can be performed, see Note above.</u>
<u>Case 9.3.B. TC corrects range</u>		
Squeeze trigger(s) with reticle on target	<u>M</u>	<u>Can be performed, see Note above.</u>

<u>Option 9.4. Engage target given no range display (loss of symbology)</u>		
SIMNET does not simulate loss of symbology.		

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
SIMNET does not simulate crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
SIMNET does not simulate cant sensor failure.		

<u>Option 9.7. Lead angle sensor failure</u>		
SIMNET does not simulate lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
SIMNET does not simulate GPS failure or thermal optics viewing conditions.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
SIMNET does not simulate GPS/TIS failure.		

<u>Option 9.10. Engage target using GAS</u>		
SIMNET does not simulate the GAS.		

	RATING	COMMENTS
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**Activity 9. ENGAGE TARGETS USING
DEGRADED GUNNERY
TECHNIQUES (continued)**
Option 9.11. Engage target given
stabilization system failure
(emergency mode)

SIMNET does not simulate stabilization system failure.

Option 9.12. Engage target given
turret power failure

SIMNET does not simulate turret power failure; no manual controls are represented.

**Activity 10. ENGAGE TARGET FROM
THE TC POSITION**
Case 10.A. Gunner cannot identify
target

Set/check switches:

• FIRE CONTROL MODE: NORMAL

H

• TIS: STBY/ON

N

TIS is not simulated, controls are painted on.
THERMAL MODE switch is painted in OFF position.

• LRF: ARM LAST RTN

H

Placement of RANGE switch (ARM 1ST RTN or ARM LAST RTN)
does not appear to effect LRF range display.

• GPS: 10X

H

• GUN SELECT: MAIN

H

• AMMO SELECT: as announced

H

Case 10.B. Three-man crew

No gunner's actions specified.

**Activity 11. ASSESS RESULTS OF
ENGAGEMENT**

Check/adjust MRS

N

MRS is not represented.
Gun tube is assumed to be straight at all times.

Case 11.A. Stationary

No gunner's actions specified.

Case 11.B. Moving

Index battlecarry ammo

H

Announce <AMMO> INDEXED

H

**Activity 12. ENGAGE TARGETS WITH
LOADER'S M240 MG**

SIMNET does not simulate Loader's M240 machinegun.

**Activity 13. IMMEDIATE ACTION-
MISFIRE**

SIMNET does not simulate main gun misfire.

<u>RATING</u>	<u>COMMENTS</u>
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Activity 14. EMPLOY SMOKE

Option 14.1. Use M250 Smoke Grenade
launcher

SIMNET does not simulate the smoke grenade launcher.

Option 14.2. Use vehicle engine
exhaust smoke system

SIMNET does not simulate vehicle exhaust smoke.

Activity 15. SUBMIT REPORTS

No gunner's actions specified.

ASSESSMENT OF TANK COMMANDER ACTIVITIES ON SIMNET

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
Enter station	<u>N</u>	Enter SIMNET through door at side of crew compartment.
Power up CWS/turret	<u>M</u>	CWS POWER/MANUAL lever is not represented. PANEL LIGHTS adjust knob, ENGINE FIRE warning light, and CKT BKR OPEN warning light are painted on. VEHICLE MASTER POWER switch is a toggle switch, not the pull-out/set switch on the M1. AUX HYDR POWER indicator light is painted on and the switch is painted on in the OFF position.
Operate domelight	<u>P</u>	Domelight does not go completely off. No red filter on domelight.
Operate intercom	<u>P</u>	Headset/boom mike are used to simulate CVC helmet. Rocker switch on cable replaces 3-position switch on helmet.
Adjust seat	<u>N</u>	CWS sight not represented. No footrest bar. TC seat does not flip down.
Adjust hatch	<u>N</u>	No hatch.
Adjust platform	<u>N</u>	No TC's platform.
Install TC's weapon	<u>N</u>	Cal .50 is not represented.
Adjust kneeguard	<u>N</u>	TC's kneeguard is not represented.
Adjust GPSE headrest/lens	<u>N</u>	GPSE headrest and lens do not adjust.
Check manual range controls	<u>M</u>	Cannot index 35 ranges into CCP. Regardless of AMMUNITION SELECT switch, BS range is 1200 meters.
Check power control handle	<u>P</u>	LRF will fire without depressing palm grips.
Check CWS in power/manual modes	<u>M</u>	CWS operates only in power mode; no traverse ring on elevation crank. CWS only traverses 300°.
Activity 2. PERFORM PREPARE- TO-FIRE CHECKS		
Supervise/assist boresight	<u>N</u>	Cannot boresight main gun; assumed boresighted.
Boresight TC's weapon	<u>N</u>	Cal .50 is not represented.
Zero TC's weapon	<u>N</u>	Cal .50 is not represented.
Select/announce battlecarry AMMO, RANGE	<u>P</u>	TC can select and announce Battlesight range, although gunner cannot enter it into CCP.

	RATING	COMMENTS
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS (continued)		
<u>Option 2.1. Prepare for offense</u>		
Receive offensive mission/formation/movement/commo	H	
Analyze terrain	P	Obstacles have less effect than they do in real-world.
Check map overlay	P	SIMNET provides special maps of simulated terrain.
Brief crew	H	
Control driver, if necessary to maintain position in platoon formation and to exploit cover and concealment	P	SIMNET vehicles are identical with no distinguishing features, makes keying on particular tank information difficult. Exploiting cover and concealment is more difficult than in real-world.

<u>Option 2.2. Prepare for defense</u>		
Issue driver commands to move with platoon to occupy battle position	P	SIMNET vehicles are identical with no distinguishing features, makes keying on particular tank information difficult. Exploiting cover and concealment is more difficult than in real-world.
Receive defensive mission/position commo	H	
Prepare primary/alternate/supplementary positions	N	Cannot prepare firing positions; cannot dismount.
Analyze terrain	P	Obstacles have less effect than they do in real-world.
Prepare tank sketch card	P	Somewhat easier to perform on SIMNET, using LRF and Azimuth indicator (not present on M1).

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search for Target(s)**Option 3.1.1. Search open hatch - day

SIMNET does not simulate open hatch viewing.

Option 3.1.2. Search closed hatch - day

Search 360°	M	TC turret only rotates 300°; TC must rotate turret instead of simply turning head.
Perform air guard duties	M	No open hatch viewing.
Execute search techniques	H	

Option 3.1.3. Search at night

SIMNET does not simulate night viewing conditions.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.2. Detect/Locate/ Identify Target(s)		
Detect target(s)/signature(s)/ obstacle(s)	<u>P</u>	<u>Only target signatures are dust and smoke from vehicles.</u>
Locate target(s)	<u>H</u>	
Identify target(s) by: • IFFN	<u>P</u>	<u>Easier to perform than in real-world; color distinguishes friendly (brown) from threat (green).</u>
• Nomenclature	<u>P</u>	<u>Easier to perform than in real-world due to limited threat target array.</u>
Note number of target	<u>H</u>	
Classify multiple targets as most dangerous/dangerous/ least dangerous	<u>H</u>	
Confirm acquisition report	<u>H</u>	
Estimate range to select weapon(s) and to evaluate LRF return	<u>M</u>	<u>Computer generated image (CGI) range cues differ substantially from real-world.</u>
Send contact report to platoon leader	<u>H</u>	

Part 3.3. Evaluate Situation		
Decide whether or not to engage contingent on: • Plt mission	<u>H</u>	
• Platoon fire plan		
• Plt ldr command		
Select the appropriate weapon/ ammunition and the firing mode (precision/degraded) contingent on: • Target range	<u>M</u>	<u>Computer generated image (CGI) range cues differ substantially from real-world. SIMNET does not support most degraded gunnery modes. SIMNET only supports main gun engagements.</u>
• Type of target (hard/soft, point/area)		
• Tank status (ammo, malfunctions)		
Determine crewman (GNR, TC, LDR) and the type of fire command (single, multiple, or simultaneous) contingent on: • Number of targets	<u>M</u>	<u>SIMNET does not support most degraded gunnery modes. SIMNET only supports main gun engagements. SIMNET does not support simultaneous engagements.</u>
• Target classification		

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Decide whether to engage target while moving or from a short halt	P	Since SIMNET does not simulate degraded mode gunnery, there is no reason to halt.
If engaging from a short halt, Issue driver command: DRIVER STOP	H	
Relay any action drill command	H	
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	
Announce FIRE, or FIRE, FIRE <ALTERNATE AMMO>	H	

<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Issue contact report: CONTACT <DIRECTION> <TARGET>	H	
Issue fire command: GUNNER <AMMO> <TARGET>	H	
Announce DRIVER MOVE OUT, GUNNER TAKE OVER	H	
Lay gun (simultaneous with fire command)	H	
Release override	H	
Sight through GPSE	H	
Evaluate range display	P	CGI range cues differ substantially from real-world.
Listen for UP	H	
Announce FIRE, or FIRE, FIRE <ALTERNATE AMMO>	H	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
<u>Case 4.3.A. Gunner fails to identify target(s)</u>		
Direct gunner onto target using one of the following techniques:		
• Verbal command: TRAVERSE <LEFT or RIGHT>, STEADY, ON	<u>H</u>	
• TRPs	<u>H</u>	
• Announce WATCH MY TRACERS and use .50 caliber tracers to point to target	<u>N</u>	<u>Cal .50 is not represented</u>
or		
Announce FROM MY POSITION and proceed with TC engagement (see Activity 10)		<u>See comments listed under Activity 10.</u>
<u>Case 4.3.B. Gunner identifies incorrect target(s)</u>		
If GNR is correct, issue a correction to the fire command	<u>H</u>	
If GNR identifies the wrong target, treat as Case 4.3.A. and proceed		<u>See comments listed under Activity 4, Case 4.3.A.</u>

<u>Option 4.4. Engage target using TIS</u>		
Engage targets using precision gunnery (Option 4.1 or 4.2)	<u>N</u>	<u>TIS not simulated.</u>
Activity 5. ADJUST FIRE		
Recover sight picture	<u>M</u>	<u>Recoil is not simulated.</u>
Observe strike of round	<u>P</u>	<u>Round impacts are cartoonish.</u>
If TARGET was observed, determine whether or not target was destroyed	<u>P</u>	<u>Easier to perform than in real-world; targets "burn" after being hit and turn black after a period of time.</u>

<u>Option 5.1. Use reengage technique</u>		
Evaluate range	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Announce FIRE	<u>H</u>	

<u>Option 5.2. Use standard adjustment</u>		
No TC actions specified		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 5. ADJUST FIRE (continued)		
<u>Option 5.3. Use TC adjustment</u>		
issue subsequent fire command to adjust fire .5-3 mils in deflection and .5-2 mils (100-400 meters) in range	<u>H</u>	
If target is destroyed or exposure too long, command CEASE FIRE	<u>H</u>	
If in defensive posture, command DRIVER, BACK UP	<u>H</u>	
Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
SIMNET does not simulate the coaxial machinegun.		
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Issue fire command: GUNNER <AMMC> <NUMBER> <TARGETS>, <RIGHT/LEFT> <TARGET> FIRST	<u>H</u>	
Engage first target using precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
If first target is not destroyed, adjust fire (Activity 5)		<u>See comments listed under Activity 5.</u>
If first target is destroyed, announce <NEXT> TARGET	<u>H</u>	
[Continue until all targets are destroyed]		
Announce CEASE FIRE	<u>H</u>	
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
SIMNET does not simulate the Cal .50 and therefore does not support simultaneous engagements.		

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Option 9.1. Engage targets using battlesight gunnery</u>		
Issue fire command: GUNNER BATTLESIGHT <TARGET>	H	
Depress MANUAL RANGE BATTLE SGT button	P	Regardless of AMMUNITION SELECT switch position, the BS range is 1200 meters.
Estimate range to target	M	CGI range cues differ substantially from real-world.
If target outside of +/- 200 meters of battlesight range, enter range change using MAN RNG B/S ADD DROP toggle switch	H	
Check range readout in GPSE	H	
Engage target using precision gunnery (Option 4.1 or 4.2) but <u>without</u> evaluating LRF display		See comments listed under Activity 4, Options 4.1. and 4.2.

<u>Options 9.2. Engage targets given ineffective LRF</u>		
SIMNET does not simulate ineffective LRF.		

<u>Option 9.3. Engage targets given multiple returns from LRF</u>		
<u>Note:</u> While the actions listed for Option 9.3, Cases 9.3.A and 9.3.B can be performed in the entirety, SIMNET only minimally supports training of the Option for the following reasons: (1) it does not appear to give false multiple returns and (2) switching between ARM 1ST RTN and ARM LAST RTN does not appear to have an effect on the LRF range displayed.		
Estimate range	M	CGI range cues differ substantially from real-world.
Evaluate range display	M	CGI range cues differ substantially from real-world.
If range appears incorrect, may instruct GNR to switch LRF setting from ARM LAST RTN to ARM 1ST RTN or v.v.	M	Can be performed, see Note above.
If multiple return symbol appears in GPSE and displayed range is outside +/- 200 m of estimated range, take either one of the following actions:		
<u>Case 9.3.A. Gunner releases</u>		
Announce RELEASE	M	Can be performed, see Note above.
<u>Case 9.3.B. TC corrects range</u>		
Correct range using MAN RNG B/S ADD/DROP toggle switch	M	Can be performed, see Note above.
If displayed range is within +/- 200 m of estimated range, announce FIRE	M	CGI range cues differ substantially from real-world. Can be performed, see Note above.

	RATING	COMMENTS
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES (continued)		
<u>Option 9.4. Engage targets given no range display (loss of symbology)</u>		
SIMNET does not simulate loss of symbology.		

<u>Option 9.5. Engage target given crosswind sensor failure</u>		
SIMNET does not support crosswind sensor failure.		

<u>Option 9.6. Engage target given cant sensor failure</u>		
SIMNET does not support cant sensor failure.		

<u>Option 9.7. Engage target given lead angle sensor failure</u>		
SIMNET does not support lead angle sensor failure.		

<u>Option 9.8. Engage target given GPS failure (day channel)</u>		
SIMNET does not support GPS failure or thermal optics viewing conditions.		

<u>Option 9.9. Engage target given GPS/TIS failure</u>		
SIMNET does not simulate GPS/TIS failure.		

<u>Option 9.10. Engage target using GAS gunnery</u>		
SIMNET does not simulate the GAS.		

<u>Option 9.11. Engage target given stabilization system failure (in emergency mode)</u>		
SIMNET does not simulate stabilization system failure.		

<u>Option 9.12. Engage target given turret power failure</u>		
SIMNET does not simulate turret power failure; no manual controls are represented.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 10. ENGAGE TARGETS FROM THE TC POSITION		
(Also Three-Man Crew Engagements)		
Issue one of the following fire commands:		
<u>Case 10.A. Gunner cannot identify target</u>		
FROM MY POSITION	<u>H</u>	
or		
<u>Case 10.B. Three-man crew (no GNR)</u>		
LOAD <AMMO>	<u>H</u>	
Estimate range to target	<u>M</u>	<u>CGI range cues differ substantially from real-world.</u>
Sight through GPSE	<u>H</u>	
Lay on center mass of target	<u>H</u>	
Depress lase button	<u>P</u>	<u>LRF will fire without depressing palm grip.</u>
Evaluate range display	<u>P</u>	<u>CGI range cues differ substantially from real-world.</u>
Make control lay	<u>H</u>	
Announce ON THE WAY	<u>H</u>	
Squeeze trigger	<u>H</u>	
Announce CEASE FIRE	<u>H</u>	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Assess battle damage/casualties	<u>M</u>	Damage is usually all-or-nothing, although a mobility kill is possible.
Determine if and how crew should be reorganized to fight in a three-man configuration	<u>H</u>	
Issue SPOTREP	<u>H</u>	
<u>Case 11.A. If tank is stationary</u>		
Determine whether to move to primary, alternate, or supplementary firing positions	<u>H</u>	
<u>Case 11.B. If tank is moving</u>		
Determine changes to route	<u>H</u>	
Issue driver commands	<u>H</u>	
Determine appropriate ammo for anticipated targets	<u>H</u>	
Announce PREPARE BATTLECARRY <AMMO> or RELOAD <AMMO>	<u>H</u>	
Enter battlecarry range using the MANUAL BATTLE SGT ADD/DROP toggle switch	<u>H</u>	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
SIMNET does not simulate the Loader's M240 machinegun.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
SIMNET does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE		
<u>Option 14.1. Use M250 smoke grenade launcher</u>		
SIMNET does not simulate the smoke grenade launcher.		

<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
SIMNET does not simulate the vehicle exhaust smoke.		
Activity 15. SUBMIT REPORTS		
Operate radio	<u>P</u>	Headset/boom mike are used to simulate CVC helmet. Rocker switch on cable replaces 3-position switch on helmet. Not all radio controls are functional.

ASSESSMENT OF LOADER ACTIVITIES ON SIMNET

	RATING	COMMENTS
Activity 1. PREPARE STATIONS FOR OPERATION		
Erect crosswind sensor	N	Crosswind sensor is not simulated.
Install LDR's machinegun	N	Loader's machinegun is not represented.
Enter LDR's station	N	Enter SIMNET through door at side of crew compartment.
Operate domelight	P	Domelight does not go completely off. No red filter on domelight.
Power up LDR's station	M	Turret blower switch is painted on in the OFF position. Antennas are not represented. Amplifier is painted on crew compartment door with switches in the following positions: MAIN PWR - OFF, POWER CKT BKR - OFF, INT ACCENT - OFF, RADIO TRANS - CDR + CRW.
Operate intercom	P	Headset/boom mike are used to simulate CVC helmet. Rocker switch on cable replaces 3-position switch on helmet.
Adjust LDR's seat/platform	N	No loader's platform. Loader's seat does not adjust.
Adjust LDR's hatch	N	No Loader's hatch.
Install/check LDR's night vision viewer	N	Night vision device (VVS-2) is not represented.
Position LDR's guards for firing	N	Loader's guards are not represented.
Operate LDR's panel	M	Turret blower switch is painted on in the OFF position. Ejection guard is represented by a toggle switch. With GUN/TURRET DRIVE switch in EL UNCPL, moving ejection guard to armed position does not return fire control system to power mode, as is the case in the M1.
Operate turret traverse lock	N	Turret traverse lock not represented.
Operate ready ammunition door in auto/manual modes	M	Does not operate in manual mode. Lock shaft is not represented. Door opening is represented by simulated sound and ammo indicator lights coming on.
Operate semi-ready ammunition door	N	Semi-ready ammunition door is not represented.
Operate hull ammunition door	N	Hull ready ammunition door is not represented.
Stow 105mm ammunition	N	Actual or simulated rounds are not used.
Operate main gun breechblock	M	Spring-loaded toggle switch represents opening/closing breechblock. Cannot close breech with wooden block.
Check replenisher	N	Replenisher not represented.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Clear/load coaxial machinegun	<u>N</u>	<u>Coax is not represented.</u>
Fill ready rack	<u>N</u>	<u>Procedures for filling ready rack is unique to SIMNET. TC selects type of ammo to be loaded into ready rack using a rotary dial on the AMMUNITION DISTRIBUTION panel. The loader then presses buttons on the ready rack panel to simulate placing rounds in the rack. Indicator lamps on the buttons indicate the type of ammo stored.</u>
Report ammo status	<u>M</u>	<u>Ammo status is shown by indicator lamps on ready rack.</u>
Load battlecarry ammo	<u>M</u>	<u>See comments listed under Activity 4, Cases 4.1.A and 4.1.B.</u>
<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>H</u>	
<u>Option 2.2. Prepare for defense</u>		
Inspect terrain to flank/rear	<u>M</u>	<u>Viewing is limited to closed hatch through loader's periscope.</u>
Activity 3. ACQUIRE TARGET(S)		
Part 3.1. Search for Target(s)		
<u>Option 3.1.1. Search open hatch - day</u>		
SIMNET does not simulate open hatch viewing.		
<u>Option 3.1.2. Search closed hatch - day</u>		
Search right front counter-clockwise to right rear	<u>P</u>	<u>Display used to indicate Turret-to-Hull orientation is difficult to view from loader's position, can cause loader problems in identifying correct search sector.</u>
Execute search techniques	<u>H</u>	
<u>Option 3.1.3. Search at night</u>		
SIMNET does not simulate night viewing conditions.		
Part 3.2. Detect/Locate/Identify Target(s)		
Detect target(s)/signature(s)/obstacle(s)	<u>P</u>	<u>Only target signatures are dust and smoke from vehicles.</u>
Locate target(s)	<u>H</u>	
Identify target(s) making the following determinations:		
IFFN	<u>P</u>	<u>Easier to perform than in real-world; color distinguishes friendly (brown) from threat (green).</u>
Nomenclature	<u>P</u>	<u>Easier to perform than in real-world due to limited threat target array.</u>
If target detected, announce LOADER REPORT (TARGET) (LOCATION)	<u>H</u>	

	<u>RATING</u>	<u>COMMENTS</u>
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.3. Evaluate Situation		
No Loader actions specified.		
<hr/>		
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Options 4.1./4.2 Engage single target from the offense/defense using precision gunnery</u>		
Drop down into turret	<u>N</u>	<u>Cannot perform since SIMNET simulates closed hatch only.</u>
Check turret ring	<u>N</u>	<u>Turret ring not represented.</u>
Set GUN/TURRET DRIVE switch in EL UNCPL position	<u>N</u>	<u>Does not return to power mode upon arming main gun, and will not fire unless in power mode; since gun tube does not move in SIMNET, loader can leave switch in POWERED position; unlike procedures in M1.</u>
<u>Cases 4.1.A./4.2.A. Announced round is not loaded</u>		
Move ejection guard to SAFE	<u>M</u>	<u>Ejection guard is represented by a toggle switch.</u>
Ensure SAFE light is lit	<u>H</u>	
Open breech	<u>M</u>	<u>Spring-loaded toggle switch represents opening/closing breechblock.</u>
Remove incorrect round from chamber, if necessary	<u>M</u>	<u>Procedure unique to SIMNET. Accomplished by pressing red LOAD button on rear of simulated breechblock.</u>
Open ammo doors	<u>H</u>	
Stow unwanted round, if necessary	<u>M</u>	<u>Procedure unique to SIMNET. Accomplished by pressing an unlit ammo indicator on ready rack.</u>
Remove correct round from stowage	<u>M</u>	<u>Procedure unique to SIMNET. Accomplished by pressing an ammo indicator with desired ammo lit up.</u>
Load desired round	<u>M</u>	<u>Procedure unique to SIMNET. Accomplished by pressing red LOAD button on rear of simulated breechblock.</u>
[Continue with Cases 4.1.B/4.2.B]		
<u>Cases 4.1.B./4.2.B. Announced round loaded</u>		
Move ejection guard to FIRE	<u>M</u>	<u>Ejection guard is represented by a toggle switch.</u>
Clear recoil path	<u>M</u>	<u>May be performed although no negative consequences can occur since there is no recoil of main gun.</u>
Announce UP	<u>H</u>	
Open ammo doors	<u>H</u>	

	RATING	COMMENTS
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.3. Gunner cannot identify announced target</u>		
No LDR actions specified.		

<u>Option 4.4. Engage targets using TIS</u>		
SIMNET does not simulate thermal optics viewing conditions.		

Activity 5. ADJUST FIRE		
Set GUN/TURRET drive switch in EL UNCPL position	P	Does not return to power mode upon arming main gun, and will not fire unless in power mode; since gun tube does not move in SIMNET loader can leave switch in POWERED position; unlike procedures in M1.
Load announced round (Case A, Option 4.1)		See comments listed under Activity 4, Cases 4.1.A. and 4.1.B.
Move ejection guard to FIRE	M	Ejection guard is represented by a toggle switch.
Clear recoil path	M	May be performed, although no negative consequences can occur, since there is no main gun recoil.
Announce UP	H	

<u>Option 5.1. Use reengage technique</u>		
No LDR actions specified		

<u>Option 5.2. Use standard adjustment</u>		
No LDR actions specified		

<u>Option 5.3. Use TC adjustment</u>		
No LDR actions specified		

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
SIMNET does not simulate the coaxial machinegun.		

	<u>RATING</u>	<u>COMMENTS</u>
Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
If first target is not destroyed, perform LDR's actions as described in Activity 5		<u>See comments listed under Activity 5.</u>
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
SIMNET does not simulate the cal .50 and therefore does not support simultaneous engagements.		
Activity 9. ENGAGE TARGETS USING DEGRADED GUNNERY TECHNIQUES		
<u>Options 9.1 - 9.12</u>		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
Perform LDR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Check replenisher reservoir	<u>N</u>	<u>Replenisher is not represented.</u>
Remove spent casings	<u>N</u>	<u>Actual or simulated rounds not used; no spent casings.</u>
Load announced round as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1. and 4.2.</u>
Announce loading status	<u>H</u>	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
SIMNET does not simulate the Loader's M240 machinegun.		

RATING	COMMENTS
Activity 13. IMMEDIATE ACTION- MISFIRE	SIMNET does not simulate main gun misfire.
Activity 14. EMPLOY SMOKE	
Option 14.1. <u>Use M250 Smoke Grenade Launcher</u>	SIMNET does not simulate the smoke grenade.
Option 14.2. <u>Use vehicle engine smoke exhaust system</u>	SIMNET does not simulate vehicle exhaust smoke.
Activity 15. SUBMIT REPORTS	
No loader's actions specified.	

ASSESSMENT OF DRIVER ACTIVITIES ON SIMNET

	<u>RATING</u>	<u>COMMENTS</u>
Activity 1. PREPARE STATIONS FOR OPERATION		
Enter DVR's station	<u>N</u>	Enter SIMNET driver compartment through full-length door at side.
Power up hull systems	<u>M</u>	Hull networks box, hull power distribution box, and parking brake system hydraulic pressure gage are not represented. The FIRE EXTINGUISHER 2ND SHOT switch on the Driver's instrument panel is painted in the closed position. VEHICLE MASTER POWER switch does not pull out. MASTER CAUTION light does not remain lit after releasing PANEL LIGHTS TEST button. TANK SELECTOR switch does not have to be pushed in to set. PANEL LIGHTS adjust knob and CABLE DISCONNECTED and CIRCUIT BKE OPEN indicator lights are painted on. The following switches on the Driver's master panel are painted on in the OFF position and their corresponding indicator lights painted on: PERSONNEL HEATER, NIGHT PERISCOPE, GAS PARTIC FILTER, BILGE PUMP, SMOKE GENERATOR, LIGHTS, HIGH BEAM.
Operate domelight	<u>P</u>	Domelight does not go completely off. No red filter on domelight.
Check turret seal	<u>N</u>	Turret seal not represented.
Operate intercom	<u>P</u>	Headset/boom mike are used to simulated CVC helmet. Rocker switch on cable replaces 3-position switch on helmet.
Adjust seat/periscopes	<u>N</u>	Seat and periscopes are not adjustable.
Adjust hatch	<u>N</u>	No hatch.
Adjust steer/throttle control	<u>N</u>	Steering/throttle control is not adjustable.
Operate drain valves	<u>N</u>	No drain valve.
Start engine	<u>P</u>	ABORT light is painted on; cannot perform aborted start procedures. PUSH TO START button does not have to be held in for sec. to start.
Make after-start checks	<u>M</u>	Transmission downshift does not occur. No parking brake-system hydraulic pressure gage. Parking brake handle is represented by a toggle switch. PARKING/SERVICE BRAKES light does not come on after holding service brake for 2 minutes. Parking brake can be engaged with a short tap of the foot.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 2. PERFORM PREPARE-TO-FIRE CHECKS		
Check fuel tanks	<u>P</u>	<u>Selector switch does not have to be pushed in to rotate.</u>
Report fuel status	<u>H</u>	

<u>Option 2.1. Prepare for offense</u>		
Receive TC briefing	<u>H</u>	
Select routes in accordance with mission and formation	<u>H</u>	

<u>Option 2.2. Prepare for defense</u>		
Drive to battle position	<u>H</u>	
Rehearse movement between primary and alternate firing positions	<u>M</u>	<u>Firing positions cannot be fortified or otherwise marked, makes identifying exact positions more difficult than in the real-world.</u>
Take primary firing positions	<u>M</u>	<u>Firing positions cannot be fortified or otherwise marked, makes identifying exact positions more difficult than in the real-world.</u>
Monitor displays	<u>H</u>	

Activity 3. ACQUIRE TARGET(S)**Part 3.1. Search for Target(s)**Option 3.1.1. Search open hatch - day

SIMNET does not simulate open hatch viewing.

Option 3.1.2. Search closed hatch - dayIf moving, follow wingman concept/
react to formation changesPSIMNET vehicles are identical with no distinguishing features, makes keying on a particular tank more difficult than real-world task.

Search fender to fender

H

Execute search techniques

HOption 3.1.3. Search at night

SIMNET does not simulate night viewing conditions.

	RATING	COMMENTS
Activity 3. ACQUIRE TARGET(S) (continued)		
Part 3.2. Detect/Locate/Identify Target(s)		
Detect target(s)/signature(s)/obstacle(s)	P	Only target signatures are dust and smoke from vehicles.
Locate target(s)	H	
Identify target(s) making the following determinations:		
• IFFN	P	Easier to perform than in real-world; color distinguishes friendly (brown) from threat (green).
• Nomenclature	P	Easier to perform than in real-world due to limited threat target array.
If target detected, announce DRIVER REPORT, <TARGET>, <LOCATION>	H	
Evaluate cover and concealment	M	Cover and concealment are difficult to determine and evaluate.

Part 3.3. Evaluate Situation		
No driver's actions specified.		

Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN		
<u>Option 4.1. Engage single target from the offense using precision gunnery</u>		
Monitor TC and platoon leader commands	H	
If TC announces HALT, stop smoothly	H	
If TC does <u>not</u> announce HALT, maintain steady platform	P	"Smoothed out" terrain and lack of movement cues (vibrations) make this task easier than in the real-world.
If antitank fire is encountered, seek cover and concealment or execute action drill	P	Cover and concealment is difficult to identify.
Alert crew of obstacles	P	Few obstacles; their impact is generally less severe than in real-world.

	<u>RATING</u>	<u>COMMENTS</u>
Activity 4. ENGAGE SINGLE TARGETS WITH THE MAIN GUN (continued)		
<u>Option 4.2. Engage single target from the defense using precision gunnery</u>		
Set TACTICAL IDLE switch to ON position	<u>H</u>	
Set transmission control to D	<u>H</u>	
Release parking brake	<u>P</u>	<u>Parking brake handle is represented by a toggle switch.</u>
Depress service brake	<u>H</u>	
Move to hull defilade position	<u>M</u>	<u>True hull defilade position is difficult to identify; cannot be confirmed by gunner due to lack of GAS.</u>
Set transmission control to R	<u>H</u>	
Depress/hold service brake	<u>H</u>	

<u>Option 4.3. Gunner cannot identify announced target</u>		
No driver actions specified.		

<u>Option 4.4. Engage target using TIS</u>		
SIMNET does not simulate thermal optics viewing conditions.		

Activity 5. ADJUST FIRE		
Return to defilade or seek alternate position	<u>M</u>	<u>Defilade positions difficult to identify; cannot be confirmed by gunner due to lack of GAS. Positions cannot be fortified or otherwise marked, make identifying positions more difficult than in real-world.</u>

Activity 6. ENGAGE A SINGLE TARGET WITH THE COAX		
SIMNET does not simulate the coaxial machinegun.		

Activity 7. ENGAGE MULTIPLE TARGETS WITH THE MAIN GUN		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
If first target is not destroyed, perform DVR's actions as described in fire adjustment (Activity 5)		<u>See comments listed under Activity 5.</u>
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>

	RATING	COMMENTS
Activity 8. ENGAGE SIMULTANEOUS TARGETS WITH THE MAIN GUN AND THE CAL .50		
SIMNET does not simulate the cal .50 and therefore does not support simultaneous engagements.		
Activity 9. ENGAGE TARGET USING DEGRADED GUNNERY TECHNIQUES		
<u>Options 9.1 - 9.10</u>		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
<u>Option 9.11 - 9.12. Engage target given stabilization system/turret power failure</u>		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Stop smoothly	H	
Resume driving	H	
Activity 10. ENGAGE TARGET FROM THE TC POSITION		
Perform DVR's actions as described in precision gunnery (Option 4.1 or 4.2)		<u>See comments listed under Activity 4, Options 4.1 and 4.2.</u>
Activity 11. ASSESS RESULTS OF ENGAGEMENT		
Respond to TC driving commands	H	
Activity 12. ENGAGE TARGETS WITH LOADER'S M240 MG		
SIMNET does not simulate the Loader's M240 machinegun.		
Activity 13. IMMEDIATE ACTION-MISFIRE		
SIMNET does not simulate main gun misfire.		
Activity 14. EMPLOY SMOKE ENGAGEMENT		
<u>Option 14.1. Use M250 Smoke Grenade Launcher</u>		
SIMNET does not simulate the smoke grenade launcher.		
<u>Option 14.2. Use vehicle engine exhaust smoke system</u>		
SIMNET does not simulate vehicle exhaust smoke.		

Device: SIMNET, Driver

RATING

COMMENTS

Activity 15. SUBMIT REPORTS

No driver's actions specified.

Appendix G

Analysis of Section/Platoon-Level Behaviors on SIMNET

PLATOON LEADERSHIP ACTIVITIES

ACTIVITY 16. ISSUE TACTICAL REPORTS

1. H
 2. H
 3. P
 - a. H
 - b. M, grid coordinates determined using Grid Azimuth Indicator, not found on actual M1 tank.
 - c. P, limited array of threat targets; color used to distinguish friendly (brown) from threat (green) targets.
 - d. H
 - e. H
 - f. H
 - g. H
 4. M
 - a. P, only FM radio is simulated.
 - b. N, cannot determine communications security; not applicable to simulation.
 - c. N, cannot determine communications security; not applicable to simulation.
 - d. N, cannot determine local requirements; not applicable to simulation.
 5. M
 - a. N, wire communications not simulated.
 - b. M, can be performed outside of the simulators.
 - c. H
-

ACTIVITY 17. ISSUE PLATOON/SECTION FIRE COMMAND

1. H
 2. H
 - a. H
 - b. H
 3. P
 - a. H
 - b. M, only main gun is simulated.
 - c. P, limited array of threat targets.
 - d. P, can use terrain features method; grid coordinates determined using Grid Azimuth Indicator, not found on actual M1 tank.
 - e. H, see Activity 26 and Activity 27.
 - f. H
 4. H
 5. H
 - a. H
 - b. H
 - c. H
-

Note. The numbers and lowercase letters listed under each activity correspond to the subordinate actions for that activity as presented in Appendix B. The ratings presented in this appendix are abbreviated as follows: highly supported = H, partially supported = P, minimally supported = M, and not supported = N.

ACTIVITY 18. REQUEST INDIRECT FIRE

Option 18.1. Request Initial Fire

1. H

Case 18.1.1. Simplified Call for Fire

1. H
2. P
 - a. H
 - b. H
 - c. M, grid coordinates are determined using Grid Azimuth Indicator, not found on actual M1 tank; direction in mils is difficult to determine; range is difficult to estimate.

Case 18.1.2. Standard Call for Fire

1. H
 2. H
 - a. H
 - b. H
 3. M
 - a. M, grid coordinates are determined using Grid Azimuth Indicator, not found on actual M1 tank; direction in mils is difficult to determine; range is difficult to estimate.
 4. H
 - a. P, difficult to distinguish vehicle types.
 - b. H
 - c. H
-

Option 18.2. Shift/Lift Indirect Fires

1. P
 - a. P, impact of rounds is difficult to observe.
 - b. M, direction in mils is difficult to determine; range is difficult to estimate.
 - c. H
 - d. H
 2. H
 - a. H
 - b. H
 - c. H
-

ACTIVITY 19. SPECIFY MOVEMENT

1. H
 - a. H
 - b. H
 - c. H
 - d. H
 2. H
 - a. See Activity 20, Option 20.4.
 - b. See Activity 20, Option 20.5.
 - c. See Activity 20, Option 20.6.
 - d. See Activity 20, Option 20.7.
 - e. See Activity 20, Option 20.8.
 3. H
 - a. H
 - b. H
 - c. H
 4. H
 5. P
 - a. H
 - b. H
 - c. N, PL cannot give hand-and-arm signals.
-

PLATOON COLLECTIVE ACTIVITIES

ACTIVITY 20. TRAVEL IN PLATOON FORMATION

Option 20.1. Move Tactically Using Wingman Concept

1. P
 - a. P, difficult to use terrain during movement.
 - b. P, difficult to distinguish vehicles while in platoon formation.
 2. P
 - a. P, cannot search open hatch.
 3. P, distances difficult to estimate.
 4. P, difficult to use terrain during movement.
 - a. P
 5. N, no open hatch mode.
-

Option 20.2. Execute Herringbone Formation

1. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. H
 - b. P, driver's reduced field of view makes it difficult to monitor other vehicles; vehicles difficult to distinguish; distances difficult to estimate.
 - c. M, cover/concealment difficult to locate, occupy, and verify.
 - d. H
 - e. H
 - f. H
 - g. M, cannot dismount to establish OP/LP; 360° viewing is difficult.
 4. M
 - a. M, cannot perform PMCS; limited number of operational faults can be diagnosed.
 - b. M, resupply and refueling methods are unique to devices.
 5. H
 - a. H
 - b. H
 - c. H
 - d. H
-

Option 20.3. Execute a Coil Formation

1. P
 - a. M, cover/concealment is difficult to locate, occupy, and verify.
 - b. H
 - c. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. H
 - b. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - c. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - d. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - e. M, cover/concealment is difficult to locate, occupy, and verify.
 - f. H
 - g. M, cannot dismount to establish OP/LP; 360° viewing is difficult.
 - h. H
-

Option 20.4. Execute a Wedge Formation

1. H
 - a. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. H
 - b. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - c. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - d. P, distances difficult to estimate.
 - e. P, only main gun is simulated.
-

Option 20.5. Execute a Echelon Formation

1. H
 - a. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. H
 - b. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - c. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - d. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - e. P, distances are difficult to estimate.
 - f. P, only main gun is simulated.
-

Option 20.6. Execute a Line Formation

1. H
 - a. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. H
 - b. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - c. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - d. P, distances are difficult to estimate.
 - e. P, only main gun is simulated.
-

Option 20.7. Execute a Vee Formation

1. H
 - a. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 3. P
 - a. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - b. P, difficult to distinguish vehicles; driver's limited field of view makes it difficult to monitor other vehicles.
 - c. H
 - d. P, distances are difficult to estimate.
 - e. P, only main gun is simulated.
-

Option 20.8. Execute a Column Formation

1. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, TC cannot give hand-and-arm signals, no open hatch mode.
 2. H
 - a. H
 - b. H
 - c. P, distances are difficult to estimate.
 - d. P, only main gun is simulated.
-

ACTIVITY 21. EXECUTE BATTLE DRILLS

Option 21.1. Execute Action Drill

Case 21.1.1. Contact

1. H
 - a. H
 - b. H
 - c. H
 - d. H
2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
3. P
 - a. P, driver's limited field of view makes it difficult to monitor other vehicles.
 - b. H
 - c. P, cover/concealment difficult to locate, occupy, and verify.
 - d. H
4. H

Case 21.1.2. Non-Contact

1. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 3. P
 - a. P, driver's limited field of view makes it difficult to monitor other vehicles.
 - b. P, driver's limited field of view makes it difficult to monitor other vehicles.
 4. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. P, see Activity 20, Option 20.1.
-

Option 21.2. Execute Contact Drill

1. H
 - a. H
 - b. H
 - c. H
 - d. H
 - e. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 3. H
 - a. H
 - b. H, see Activity 26, Option 1 and Activity 27, Option 3.
 - c. H, see Activity 26, Option 1 and Activity 27, Option 3.
-

Option 21.3. React to Air Attack

1. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 - c. H
 3. P
 - a. H
 - b. P, distances are difficult to estimate.
 - c. P, only main gun is simulated.
 - d. M, cover/concealment is difficult to locate, occupy, and verify.
 - e. H
 - f. M, cannot search open hatch.
-

Option 21.4. React to Indirect Fire

1. P
 - a. H
 - b. N, no open hatch mode; vision blocks do not close.
 - c. M, masks can be worn, although gas particulate filter system is not simulated.
 - d. H
 2. M
 - a. N, no open hatch mode; vision blocks do not close.
 - b. M, masks can be worn, although gas particulate filter system is not simulated.
 - c. M, cover/concealment are difficult to locate, occupy, and verify.
 - d. M, no prepared defensive positions; turret down positions difficult to occupy, no GAS to verify.
 3. H
 4. P
 - a. N, vision blocks do not close.
 - b. H
 - c. N, no NBC conditions to monitor.
 - d. H
 - e. H
-

ACTIVITY 22. BOUND BY SECTION

1. H
 - a. H
 - b. H
 2. P
 - a. N, PL cannot give hand-and-arm signals, no open hatch mode.
 - b. H
 3. P
 - a. M, cover/concealment difficult to locate, occupy, and verify.
 - b. P, only main gun is simulated.
 - c. H
 - d. P, cannot search open hatch.
 - e. P, cannot search open hatch.
 4. P
 - a. P, cover/concealment routes difficult to locate and use.
 - b. P, only main gun is simulated.
 - c. P, cannot search open hatch.
 - d. H
-

ACTIVITY 23. OVERWATCH A BOUNDING PLATOON

1. P
 - a. M, cover/concealed firing positions difficult to locate; cannot dismount vehicles to walk or improve terrain.
 - b. P, field of view is less than in actual M1 tank.
 - c. P, cannot dismount vehicles to inspect positions.
 - d. H
 2. M
 - a. M, cover/concealment/hull-down position difficult to occupy and verify.
 - b. P, only main gun is simulated.
 3. P
 - a. H
 - b. N, thermal imagery system is not simulated.
 4. H
 - a. H
 - b. P, only main gun is simulated.
 - c. H
-

ACTIVITY 24. OCCUPY A BATTLE POSITION

Option 24.1. Occupy Initial Battle Position

1. N
 - a. P, formations can be executed; hide positions difficult to locate, occupy, and verify.
 - b. N, cannot dismount vehicles.
 - c. N, cannot dismount vehicles.
2. M
 - a. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle; improved BPs not simulated.
 - b. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle.
 - c. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle.
 - d. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle.
 - e. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle; covered/concealed routes difficult to locate and use.
 - f. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle; covered/concealed routes difficult to locate and use.
 - g. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle.
 - h. M, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle; few obstacles; obstacles cannot be reinforced.
 - i. H, cannot conduct dismounted recon; can be performed using map of SIMNET terrain or from vehicle; few obstacles; obstacles cannot be reinforced.
3. H
 - a. H
4. M
 - a. N, cannot give hand-and-arm signals, no open hatch mode.
 - b. M, turret-down positions difficult to occupy and verify.
 - c. M, hull-down positions difficult to occupy and verify.
 - d. M, difficult to perform open hatch mode; direction determined using Grid Azimuth Indicator not found on actual M1 tank.
 - e. M, hide positions difficult to locate, occupy, and verify.
 - f. M, difficult to perform.
 - g. H
 - h. H
5. N
 - a. N, cannot dismount vehicle to camouflage vehicles or equipment.
 - b. N, cannot dismount vehicle to improve terrain.
 - c. N, cannot dismount vehicle to establish wire communications.
 - d. N, cannot dismount vehicle to establish OPs or improve terrain.
 - e. N, cannot dismount vehicle to employ chemical agent alarms.
 - f. N, cannot dismount vehicle to employ PEWS.
 - g. N, cannot dismount vehicle to emplace obstacles.
 - h. M, difficult to identify positions due to lack of terrain features.
 - i. N
6. M
 - a. M, cannot dismount to inspect use of cover/concealment, must be performed from vehicles.
 - b. H
 - c. N, cannot emplace camouflage.
7. P
 - a. P, difficult to perform given lack of open hatch mode and few terrain features.
 - b. H
 - c. P, difficult to shift firing positions due to lack of cover/concealment.
8. N
 - a. N, obstacles cannot be emplaced on SIMNET terrain.
 - b. N, obstacles cannot be emplaced on SIMNET terrain.
 - c. N, obstacles cannot be emplaced on SIMNET terrain.
 - d. N, obstacles cannot be emplaced on SIMNET terrain.
 - e. N, obstacles cannot be emplaced on SIMNET terrain.

9. N
 - a. M, cannot dismount to improve or recon SIMNET terrain; recon must be performed from vehicles.
 - b. N, obstacles cannot be emplaced on SIMNET terrain.
10. H
 - a. H
11. P
 - a. P, must be performed using map of SIMNET terrain, cannot conduct dismounted recon.
 - b. H
 - c. P, must be performed using map of SIMNET terrain, cannot conduct dismounted recon; exact locations can be determined using Grid Azimuth Indicator, not found on actual M1 tank.
 - d. M, must be performed using map of SIMNET terrain, cannot conduct dismounted recon; OPs cannot be established.
 - e. P, will be altered for use in simulation.
 - f. P, difficult to perform, must see view from various vehicles.
 - g. N, obstacles cannot be emplaced on SIMNET terrain.
12. H
 - a. H
 - b. H
13. H
 - a. H
14. M
 - a. M, cannot improve positions, position OPs, or emplace obstacles.
 - b. M, rehearsals are difficult to conduct due to difficulty in identifying positions.

Option 24.2. Occupy Subsequent Battle Positions (Displace to a subsequent battle position)

1. P
 - a. H
 - b. H
 - c. N, not applicable to SIMNET simulation.
 - d. M, vehicle faults are corrected by waiting a specified period of time, which is to simulate time necessary to repair vehicle.
 - e. H
2. P
 - a. H
 - b. M, hide positions are difficult to locate, occupy, and verify.
 - c. H
 - d. P, covered/concealed routes are difficult to locate and use.
3. P
 - a. H
 - b. M, hide positions are difficult to locate, occupy, and verify.
 - c. H
 - d. P, covered, concealed routes difficult to locate and use; difficult to identify positions on SIMNET terrain.
 - e. N, smoke not simulated.
4. H
 - a. H
 - b. H
 - c. P, only main gun is simulated.
 - d. H
5. M
 - a. M, cannot dismount to recon or improve terrain; turret-down positions to locate, occupy and verify.
 - b. M, hull-down positions are difficult to locate, occupy and verify.
 - c. M, firing positions are difficult to locate, occupy, and verify.
 - d. P, only main gun is simulated.
6. M
 - a. M, hide positions are difficult to locate, occupy, and verify.
 - b. M, hide positions are difficult to locate, occupy, and verify.
 - c. M, hide positions are difficult to locate, occupy, and verify.
 - d. H, hide positions are difficult to locate, occupy, and verify.

7. P
 - a. P, PL can give order, although positions are difficult to locate, occupy, and verify.
 - b. P, difficult to perform due to few terrain features.
 - c. M, firing positions difficult to locate.
 - d. M, covered/concealed routes difficult to identify.
 8. M
 - a. M, firing positions difficult to locate.
 - b. M, covered/concealed routes difficult to identify.
 - c. M, cannot give hand-and-arm signals, no open hatch mode, can waggle gun tube.
 9. P
 - a. H
 - b. M, PL can give order, although turret-down positions are difficult to locate, occupy, and verify.
-

ACTIVITY 25. MANEUVER WITHIN BATTLE POSITION

1. H
 - a. H
 - b. H
2. P
 - a. N, cannot emplace obstacles on SIMNET terrain.
 - b. N, smoke not simulated.
 - c. H
 - d. H
3. H
 - a. P, exact location of positions is difficult to determine.
 - b. H
 - c. H
4. P
 - a. P
 - b. N, cannot give visual signals, no open hatch mode.
5. M, difficult to quickly locate predetermined positions.
6. H

Case 25.1. Maneuver by Platoon

1. P, only main gun is simulated.
2. M, difficult to locate predetermined positions.

Case 25.2. Maneuver by Sections

1. H
2. M, only main gun is simulated, difficult to locate predetermined positions.
3. M, only main gun is simulated, difficult to locate predetermined positions.

Case 25.3. Maneuver within Sections

1. P, only main gun is simulated.
 2. P, only main gun is simulated.
 3. M, difficult to locate predetermined positions.
-

ACTIVITY 26. EMPLOY FIRE PATTERNS

Option 26.1. Employ Frontal Fire

1. H
 - a. H
 2. H
 - a. P, only
 - b. H
 3. P
 - a. P, only main gun is simulated.
 - b. P, only main gun is simulated.
 - c. P, only main gun is simulated.
 - d. P, only main gun is simulated.
 4. H
 - a. H
 5. H
 - a. H
 - b. H
-

Option 26.2. Employ Cross Fire

1. H
 - a. P, only main gun is simulated.
 2. H
 - a. P, only main gun is simulated.
 - b. H
 3. P
 - a. P, only main gun is simulated.
 - b. P, only main gun is simulated.
 - c. P, only main gun is simulated.
 - d. P, only main gun is simulated.
 4. H
 - a. H
 5. H
 - a. H
 - b. H
-

Option 26.3. Employ Depth Fire

1. H
 - a. H
2. H
 - a. P, only main gun is simulated.
 - b. H
3. P
 - a. P, only main gun is simulated.
 - b. P, only main gun is simulated.
 - c. P, only main gun is simulated.
 - d. P, only main gun is simulated.
4. H
 - a. H
 - b. H
 - c. H
 - d. H

- 5. H
 - a. H
 - b. H
-

ACTIVITY 27. EMPLOY FIRING TECHNIQUES

Option 27.1. Employ Observed Fire

- 1. P
 - a. P, protected defensive positions are difficult to locate and occupy.
 - 2. H
 - a. P, only main gun is simulated.
 - b. H
 - 3. H
 - a. P, only main gun is simulated.
 - b. H
 - 4. H
 - 5. H
 - a. H
 - b. H
-

Option 27.2. Employ Alternating Fires

- 1. H
 - a. P, defensive positions are difficult to locate and occupy.
 - b. H
 - 2. H
 - a. P, only main gun is simulated.
 - b. H
 - 3. P
 - a. P, only main gun is simulated.
 - b. P, only main gun is simulated.
 - 4. H
 - a. H
 - b. H
-

Option 27.3. Employ Simultaneous Fires

- 1. P
 - a. H
 - b. H
 - c. N, only main gun is simulated, cannot conduct simultaneous engagements.
 - 2. H
 - a. P, only main gun is simulated.
 - b. H
 - 3. H
 - a. P, only main gun is simulated.
 - b. H
 - 4. H
 - a. H
 - b. H
-

Appendix H

Assessment of Basic Tactical Gunnery Knowledges Covered By Hand-Held Tutor

Knowledge	Instruction Provided By HHT?
<u>Tank Commander</u>	<u>YES/NO</u>
Locate task in TM and perform task procedures according to instructions.	<u>NO</u>
Identify appropriate battlecarry ammo and battlesight range.	<u>NO</u>
Identify appropriate tank positions during movement.	<u>NO</u>
Identify sources of cover and concealment.	<u>NO</u>
Recall procedures for analyzing terrain.	<u>NO</u>
Demonstrate use of map overlay.	<u>NO</u>
Identify primary, alternate, and supplementary positions.	<u>NO</u>
Recall procedures for preparing sketch range card.	<u>NO</u>
Identify crew search sectors.	<u>NO</u>
Identify appropriate gun tube orientation.	<u>NO</u>
Demonstrate appropriate search techniques.	<u>NO</u>
Identify target signatures.	<u>NO</u>
Recall methods of reporting target location.	<u>NO</u>
Identify targets as friend/foe/neutral and by nomenclature.	<u>NO</u>
Classify targets by threat.	<u>YES</u>
Recall appropriate procedure for estimating range to target.	<u>NO</u>
Recall elements of appropriate verbal reports/announcements/commands.	<u>YES</u>
Identify appropriate weapon, ammo, and firing mode.	<u>YES</u>
Recall elements of appropriate fire command.	<u>YES</u>
Recall function and operation of TC control handles.	<u>NO</u>
Recall TCs standard adjustments.	<u>YES</u>
Recall function and operation of CWS controls to traverse elevate, and fire Cal . 50.	<u>NO</u>
Identify aiming point on Cal . 50 reticle.	<u>NO</u>
Recall function and operation of manual range controls.	<u>NO</u>
Interpret LRF symbols/readout.	<u>YES</u>

Knowledge

Instruction Provided
By HHT?

Tank Commander (continued)

YES/NO

Recall function and operation of lase buttons.

YES

Identify aiming point on reticle.

NO

Recall appropriate reassignment of tank crew duties.

NO

Identify appropriate pattern of fire for smoke grenades.

NO

Recall operation of M250 grenade launcher.

NO

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Knowledge**Instruction Provided
By HHT?**

Gunner**YES/NO**

Locate task in TM and perform task procedures according to instructions.

NO

Recall procedures for determining turret/hull defilade.

NO

Identify crew search sectors.

NO

Identify appropriate settings for GNR station switches.

YES

Demonstrate appropriate search techniques.

NO

Identify target signatures.

NO

Recall methods of reporting target location.

NO

Identify targets as friend/foe/neutral and by nomenclature.

NORecall appropriate procedure for estimating range to target.^aNO

Recall procedures for operating GNR control handles.

NO

Identify appropriate aiming point on reticle.

NO

Recall operation and function of lase buttons.

YES

Recall elements of appropriate verbal reports/announcements.

YES

Recall procedures for retrieving/storing data in ballistic computer.

NO

Recall procedures for conducting computer self test.

NO

Interpret output from computer self test.

YES

Determine appropriate compensation for cant.

YES

Recall function and operation of manual traverse/elevation controls.

NO

Recall function and operation of MRS.

NO

Recall function and operation of manual firing controls.

YES

Interpret LRF symbols/readout.

YES

Recall gunner's standard adjustments.

YES

Recall procedure for applying manual lead.

NO

^aBecause of his position, gunner's performance of this task is limited. He does not have the range of options open to the TC.

Knowledge**Instruction Provided
By HHT?**

Loader**YES/NO**

Locate task in TM and perform task procedures according to instructions.

NO

Identify crew search sectors.

NO

Demonstrate appropriate search techniques.

NO

Recall function and operation of VV-2.

NO

Identify target signatures.

NO

Recall methods of reporting target location.

NO

Identify targets as friend/foe/neutral and by nomenclature.

NO

Identify announced ammo.

NO

Recall function of GUN/TURRET DRIVE switch.

NO

Recall function and operation of ejection guard.

NO

Recall procedures for loading main gun round.

NO

Recall procedures for unloading/storing main gun round.

NO

Recall elements of appropriate verbal reports/announcements.

YES

Identify appropriate fluid level in replenisher reservoir.

NO

Recall operation of M240 MG.

NO

Recall procedures to perform manual extraction of main gun round.

NO

Knowledge**Instruction Provided
By HHT?**

Driver**YES/NO**

Locate task in TM and perform task procedures according to instructions.

NO

Identify appropriate tank positions during movement.

NO

Identify routes of movement.

NO

Identify sources of cover and concealment.

NO

Identify primary, alternate, and supplementary positions.

NO

Recall procedures to drive M1 tank.

NO

Identify crew search sectors.

NO

Demonstrate appropriate search techniques.

NO

Recall function and operation of VV-2.

NO

Identify target signatures.

NO

Recall elements of appropriate verbal reports/announcements.

YES

Identify targets as friend/foe/neutral and by nomenclature.

NO

Recall function and operation of SMOKE GENERATOR switch.

NO
